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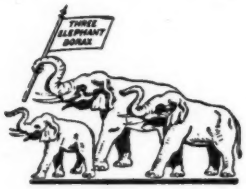

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Better Crops with PLANT FOOD

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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXIX NO. 2

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OLD VALENTINES RENEW FOND MEMORIES

Better Crops with PLANT FOOD

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VOL. XXIX WASHINGTON, D. C., FEBRUARY, 1945 No. 2

Musings of a . . .

Silo Scribe

Jeff McDermid

LET a Silo Scribe turn reminiscent. About 25 years ago a sturdy Midwest farm journal publisher bade Godspeed to a fledging writer whom he had just put on the payroll. This silver-haired, broad-shouldered veteran of the Civil War picked his reporters from the printing profession, as he was himself a graduate of the case and the make-up form. Young tyros with some experience on a country weekly palladium of liberty stood the best chance to try their wings on the weekly farm papers he published. Of course farm experience played some part in the selections, but he ran a publication first and foremost and anyone with a flair for the press room had more chance than a college degree man in animal husbandry.

Under a clear, frosty moonlit sky this big, hearty man shook hands with his latest and newest acquisition and sent him forth to the promised land of an adjacent state to shoot copy for one of a quartet of noteworthy rural circulators to which farm folks subscribed by thousands.

In parting with his new reporter, this was the publisher's blessing:

"Go right out there and keep your eyes and your mind open, and remember I'm backing you up. Send us lots of copy and get it here on time before deadline each week. As for your expense accounts, don't be stingy with yourself. I want our boys to travel and live well. When your expenses run very small, I'll think you are not getting out enough among the farmers. We can't run a good farm paper sitting at home clipping warmed-over dope from bulletins and other farm papers. Good-bye and God bless you!"

Since that balmy spring evening quite a spell ago—even before the end of World War One—the ambitious reporter can ease back in his rickety chair and glance at the leather backs of over two-score bound yearly volumes of agricultural "literature," bucolic opinions and farm facts, which embalm the dead past with no small part of his own energy, hope, and current enthusiasm.

Needless to say, the welcome and the impetus given back there by this determined old journalistic war-horse have served to carry the once-youthful silo scribe safely into the upper middle years without regret, remorse, or reproach. They permitted him to enjoy many boon companions and rare acquaintances and initiated him into a profession that is distinctive although perhaps without distinction.

Given a field of wide horizons, varied weather, long hours, happy overtime zest for labor, and open rural roads lined with weeds and grasshoppers by day and bull frogs and dew by nightfall; given long, lonely stretches of country highway and a fairly good car, and the day's past incidents wove themselves naturally into a pattern for later retelling, with "lead" and emphasis neatly planned in advance. And finally the lights of home, and the typewriter waiting the nervous touch or the kodak releasing its roll!

SOME folks keep scrapbooks. I don't need to as long as those remorseless records of my impudence, imprudence, and inventivenes stare at me like black imps in a life pageant. Many moods long forgotten, many friends gone away, and many milestones in our waves of agrarian upheaval are sure to become fresh and vivid again when one takes the time to skim and dip among the old issues in which much pride was taken and some risks were run. To all of which we once more echo—*sans* remorse and *sans* reproach.

Looking backward (one should never do it) I can see nevertheless some places where as a writer I sadly misjudged certain well-wishing leaders whose vehemence and ardor were mixed up with political bickerings or cooperative squabbles. In scanning anew some of my ancient output about those same bygone leaders I sense a lack of discernment, too much taken for granted on the run, much too much hearsay and innuendo, with a net result not flattering to them as read by patient and trustworthy subscribers not present at the meetings.

On the other hand I presume this shortcoming is nicely balanced by the puffs and booms given to a few other gentlemen of the hour in agriculture who really got more publicity and attention from me than they deserved.

ON the whole we scribblers for farm perusal usually treated the subject more delicately and feelingly than did our brothers who often sat beside us representing the raw, censorious, cynical daily press. Their objective was to find a thrill and a climax in everything, a stunning opener that would make a dashing headline tomorrow. Ordinary yokel reputations and inner details and ripe reasoning about the movement in hand did not concern them much. They were not living the same life, eating at the same tables, hoping for the dawn of progress and sanity in farm life, as we were.

Consequently what they dished up for daily delight usually had a different color and a more acid bite to it than the slower and more deliberate digests prepared by us after a long ride home and a night's rest to think it over and get our perspective.

A rare old speaker at one of our Equity sessions long ago was a comical gent to look at, and a joy to hear. He loved to button up his frock coat (being a lawyer with six farms at rent) and plunge into the debate with abandon. He was a nice dish for the daily boys, who made over his remarks to suit their fancy. But to us chaps with a regular background of the traditions of the Equity and its need for vibrant suspense and declamatory effect, he was treated as one of the scores of sages

whose debates in those old, streaky halls laid foundations for an aroused and vocal agriculture. Not a word was said of his appearance and oddities, for most of the best ones had plenty of both features. We kept to the text, followed the reasoning and the rebuttal, and emerged with something that we hope gave far-off readers a picture of what really happened in their big pow-wow.

Of course, there came a time somewhat later on when professional politicians secured a strangle hold on the good old Equity and other similar agrarian movements. I was slow to see it

coming, but finally rendered the service entrusted to me and helped bury the corpse of a once vigorous society so as to make room for a group of active forces in farm marketing who supplanted to some extent the duties of the original farm propaganda associations.

I have always been afraid of hasty impressions put through the linotype. That's mainly why trade papers and farm papers have had a little better chance to come clean with facts, if they wanted to. The daily boys were hired to work fast and do it every hour, without much chance to come back and add a postscript or an explanation. Moreover, none of the daily boys wrote his own editorial page. In our case many of us reporters doubled in brass, as the circus men say, and took our turns in the column of official opinion. Thus we who attended the meetings and heard the talks could pitch in and do simple justice to the topic coming and going, by dint of editorial expression, as well as the news story.

Your daily paper could retract its statements and correct its errors the following day if necessary. Our sheets with far less frequent publication dates found it hard to insert corrections and omissions and apologies so long after the original incident occurred. That also made us cagey and careful, and protected our readers from confusion.

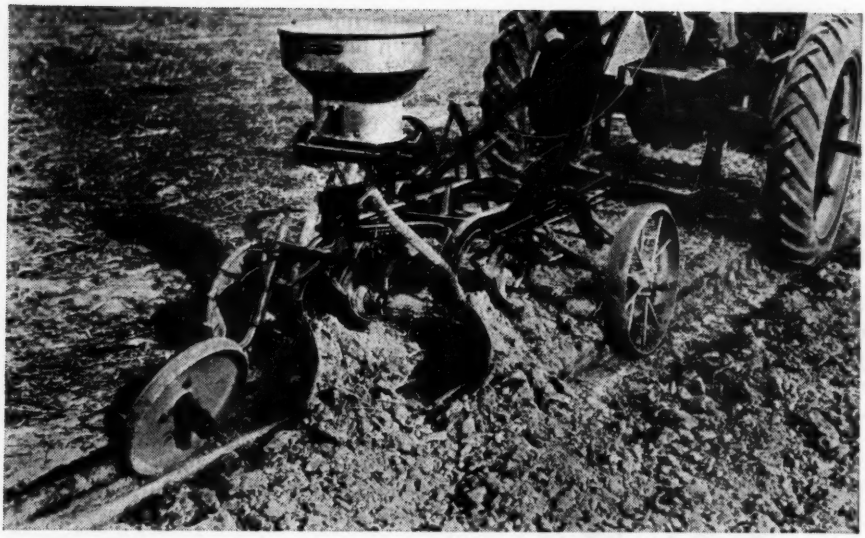
Truth remains the same although the manner of its dress often changes. One who has delved and deviled in the farm journalistic field for a quarter of a century, like a few score of us old cronies have, cannot pass the time of day over a mug of ale without decanting about the shifting scenery.

Take numbers and appearance and style of treatment. In numbers there has been a decline. Once nearly every state boasted two or maybe three or four competing state farm papers, rivals to the teeth and skimming the countryside for news and opinion—and livestock ads. Just as farmers saw small holdings taken up by degrees into the maw of corporations and syndicate agricultural endeavor rich with capital and keen to conquer, so likewise have the state farm papers merged and become centralized in fewer hands. It was a necessary move in the depth of the w. k. depression, because those 'rivals of golden days could not stand the shock of such pressure.

INSTEAD, therefore, of the isolated individual state publication being a law unto itself and collector of its own advertising revenue, the situation since the depression has tended to bring the state farm press into a battle royal with the national magazine type of farm periodical. Forced to total combined circulations in blocs and groups, and compare this strength of coverage with that of the nationals, the emphasis is not so much upon service to a state as it is to claim regional power and prestige.

I make no claim that the old provincial state paper was any better or more readable than the ones we issue today. In fact this brings up the greatest change of all—make-up and illustration.

(*Turn to page* 51)



Fertilizer attachment for a two-bottom plow. Note placement of fertilizer in bands on the plow-sole. Several manufacturers are now making this equipment. It can be attached to practically any make of plow.

Plow-Sole Fertilizing on the Average Farm

By C. J. Chapman

Soils Department, University of Wisconsin, Madison, Wisconsin

IN spite of a late wet spring and delayed planting, Wisconsin's corn crop in 1944, totaling 2,679,000 acres, came through with a record production of better than 116 million bushels. This represents an increase of some 7% over the 1943 crop and 41% above the 10-year average (1933 to 1942). The average yield for 1944 was 43.5 bushels per acre compared with a 10-year average (1933-42) of 35 bushels per acre. While the increase in the average yield for 1944 over the 10-year average is due in part to the more extensive plantings of hybrid varieties, yet it also is due in part to the improved state of fertility of Wisconsin farms.

Certainly, the 10 million tons of lime applied to Wisconsin farm lands in the past 10 years has had an influence and we know that the greatly increased use of fertilizer in the past few years has been a factor in pushing up yields. This vast tonnage of lime has resulted in a larger acreage of better alfalfa and clover. In turn, more nitrogen and organic matter have been added to the soils. Corn, of course, has been the chief beneficiary of this added nitrogen and humus.

But even 43 bushels per acre, while a pretty good average, does include thousands and thousands of acres of corn that made yields of 20, 25, and 30 bushels per acre. On the other hand, there were many thousands of acres that made 75, 80, and 90 bushels per acre. If every acre of corn planted had been

adequately supplied with all the plant-food nutrients it could have made use of profitably, the average yield might easily have hit the 65-bushel mark. If Wisconsin farmers throughout the State had used from 600 to 800 lbs. of 8-8-8 fertilizer per acre and applied it by the plow-sole method to those low fertility fields, the average yield might have been raised by a good 15 and possibly 20 bushels per acre.

But now the question of whether the average small farm operator on the 100- to 160-acre farm can afford to use 600 to 800 lbs. per acre of an 8-8-8 fertilizer costing about $14 is being raised. A high percentage of growers of hybrid seed corn have found or will find these heavy applications of 8-8-8 and other high-nitrogen mixtures profitable on their upland soils. Such crops as sugar beets, tobacco, cabbage, tomatoes, beets for canning, carrots, and many other vegetable crops, including melons and cucumbers, which have a high per-acre value, will respond profitably to these heavy applications of high-nitrogen fertilizers when grown on upland soils and where little or no manure is used.

It has been shown that the plow-sole method of applying this fertilizer at heavy rates in many cases is superior to surface application or broadcasting and plowing under the fertilizer. The WEEKLY NEWS service of the U. S. Department of Agriculture in a release of October 11, 1944, says, "Placing fertilizer at the bottom of the plow furrow at the time of turning the soil is a promising method for some crops, according to the U. S. Department of Agriculture. Tests of the method during the past crop season by engineers of the agricultural research administration gave good results in fields later planted to tomatoes, potatoes, and cabbage. The good results are attributed to the fact that even in dry weather the soil at this depth is likely to be damp enough to make the plant food available to the roots of these crops. Placement of fertilizer in bands is beginning to show better yields than broadcasting on canning crops in western Washington. For some crops, particularly the deep-rooted beets and carrots, placing the fertilizer four and five inches below the seed was better than side placement."

But what about this average farmer who plants 30 to 40 acres of corn and grows this corn in a rotation with clover, alfalfa, and small grain on a farm where all the crops are fed to livestock and the manure produced is returned to the crop land every year? For this average farmer, for many years we have been recommending a fertility program about as follows: The liming of every acre of acid soil on the farm and the application of from 200 to 300 lbs. per acre of a phosphate or phosphate-potash fertilizer such as 0-20-0, 0-20-10, or 0-20-20 at the time of seeding down. We have urged our farmers to take good care of their stable manure and get it back on the cultivated fields. For corn in the rotation, we have advised the application of 100 to 150 lbs. per acre of 3-18-9 or 3-12-12 fertilizer in the hill or row as a supplement to stable manure. In my judgment, this is a well-rounded soil fertility program. And those few farmers who have fol-

Elmer Wiegel and his wife displaying samples of corn from the plot which received 2-12-6 at 100 lbs. per acre in hill (right) and yielded 98.7 bu. per acre compared with the plot which received 700 lbs. of 8-8-8 on plow sole plus 2-12-6 in the hill (left) and yielded 121.9 bu. per acre.

1944 Results of Plow-Sole Fertilizer Demonstrations in Wisconsin

Corn yields are calculated on basis of a perfect stand (3 stalks per hill) and 14% moisture basis. Sweet corn figured at $28 per ton (net.) Field corn at $1 per bushel. Hybrid seed corn at $6 per bushel. Silage at $6 per ton. Hemp Grade No. 1 at $50 per ton; Grade No. 2 at $40 per ton. Sugar beets at $12.50 per ton.

Name and address of cooperator and soil type	Crop	Plot No.	Treatment and how applied	Yield per acre	Increase per acre	Value of increase	Profit over cost fertilizer
Irving Seaman and George C. Knepel Brown Deer, Wisconsin Miami Clay Loam	Sweet Corn	1	125# 3–12–12	5838 lbs.			
		2	125# 3–12–12 in hill plus 600# 8–8–8 on plow-sole	8256 lbs.	2418 lbs.	$32.64	$20.71
		3	125# 3–12–12 in hill plus 1000# 8–8–8 on plow-sole	8667 lbs.	2700 lbs.	36.84	16.95
Clem Herling and Albert Bookhout Verona, Wisconsin Miami Silt Loam	Field Corn	1	100# 2–12–6 in hill	64.7 bu.	9.6 bu.	9.60	7.99
		2	100# 2–12–6 in hill plus 700# 8–8–8 on plow-sole	94.7 bu.	39.6 bu.	39.60	23.29
		3	No fertilizer	55.1 bu.			
Elmer Wiegel Shullsburg, Wisconsin Tama Silt Loam	Field Corn	1	100# 2–12–6 in hill	98.7 bu.	4.6 bu.	4.60	2.99
		2	100# 2–12–6 in hill plus 700# 8–8–8 on plow-sole	121.9 bu.	27.8 bu.	27.80	11.49
		3	No fertilizer	94.1 bu.			
H. J. Niglis Verona, Wisconsin Miami Silt Loam	Field Corn	1	125# 2–12–6 in hill	62.2 bu.			
		2	125# 2–12–6 in hill plus 800# 8–8–8 on plow-sole	84.1 bu.	21.9 bu.	21.90	5.10
		3	125# 2–12–6 in hill plus 300# am. nitrate on plow-sole	78.2 bu.	16.0 bu.	16.00	6.05
H. J. Niglis Verona, Wisconsin Miami Silt Loam	Silage Corn	1	125# 2–12–6 in hill	8.2 tons			
		2	125# 2–12–6 in hill plus 800# 8–8–8 on plow-sole	11.8 tons	3.6 tons	21.60	4.80
Clarence Trachte Johnson Creek, Wisconsin Miami & Clyde Silt Loam	Hybrid Seed Corn (Planted 3'x3')	1	250# 2–12–6 in hill	95.5 bu.	15.1 bu.	90.60	87.98
		2	250# 2–12–6 in hill plus 700# 8–8–8 on plow-sole (fall of 1943)	114.8 bu.	34.4 bu.	206.40	189.08
		3	250# 2–12–6 in hill plus 700# 8–8–8 on plow-sole (spring 1944)	117.7 bu.	37.3 bu.	223.80	206.48
		4	No fertilizer	80.4 bu.			

James Farms Ft. Atkinson, Wisconsin Waukesha Loam (field in high fertility but hurt by dry weather)	Hybrid Seed Corn	1	125# 2–12–6 in hill	75.7 bu.	2.3 bu.	13.80	11.80
		2	125# 2–12–6 in hill plus 700# 8–8–8 on plow-sole (fall of 1944)	77.3 bu.	3.9 bu.	23.40	6.70
		3	125# 2–12–6 in hill plus 700# 8–8–8 on plow-sole (spring 1944)	77.2 bu.	3.8 bu.	22.80	6.10
		4	No fertilizer	73.4 bu.			
Eric and Ed Aspnes DeForest, Wisconsin Carrington Silt Loam	Hemp	1	175# 3–12–12 with drill	3032 lbs.	918 lbs.	13.77	10.44
		2	175# 3–12–12 with drill plus 700# 8–8–8 on plow-sole (fall—1943)	7708 lbs.	5594 lbs.	139.85	121.82
		3	175# 3–12–12 with drill plus 700# 8–8–8 on plow-sole (spring 1944)	6866 lbs.	4752 lbs.	118.80	100.77
		4	175# 3–12–12 with drill plus 250# am. nitrate drilled deep ahead of seeding	7086 lbs.	4972 lbs.	124.30	114.74
		5	No fertilizer	2114 lbs.			
Elmer Kallas Ripon, Wisconsin Carrington Silt Loam	Hemp	1	150# 4–10–6 with drill	5154 lbs.	240 lbs.	6.00	3.41
		2	150# 4–10–6 with drill plus 700# 8–8–8 on plow-sole	10924 lbs.	5770 lbs.	144.25	126.96
		3	No fertilizer	4910 lbs.			
Quinton Williams Ripon, Wisconsin Carrington Silt Loam	Hemp	1	300# 2–12–6 with drill	5110 lbs.			
		2	300# 2–12–6 with drill plus 700# 8–8–8 on plow-sole	6778 lbs.	1668 lbs.	41.70	22.20
A. R. Livingston Beloit, Wisconsin Waukesha Silt Loam	Hemp	1	150# 3–9–18 with drill	4360 lbs.	242 lbs.	4.84	1.79
		2	150# 3–9–18 with drill plus 700# 8–8–8 on plow-sole	10616 lbs.	6498 lbs.	162.45	144.70
		3	700# 8–8–8 on plow-sole	8812 lbs.	4694 lbs.	117.35	102.65
		4	No fertilizer	4118 lbs.			
Mrs. Ray Decker Janesville, Wisconsin Waukesha Silt Loam	Hemp	1	200# 4–10–6 with drill	4778 lbs.	2102 lbs.	42.04	38.59
		2	200# 4–10–6 with drill plus 800# of 8–8–8 on plow-sole	8016 lbs.	5340 lbs.	133.50	113.25
		3	No fertilizer	2676 lbs.			
Wenzel Wenig Chilton, Wisconsin Miami Silt Loam	Sugar Beets	1	125# 3–12–12 with drill	13.63 tons	1.37 tons	17.13	14.75
		2	125# 3–12–12 with drill plus 700# 8–8–8 on plow-sole	15.13 tons	2.87 tons	35.87	18.79
		3	No fertilizer	12.26 tons			

lowed it are growing good crops and are balancing pretty well their soil fertility budget each year.

But let's look into the actual situation existing on a high percentage of the average individual farms throughout the State. The situation is quite different from that ideal and model farm just described, where all these good practices are being carried out. During the past 23 years, as part of my extension activities, I have made detailed examinations of some 2,500 farms in Wisconsin through the medium of our State Soil Laboratory. This individual farm examination service includes the taking of soil samples from the various fields on the farm. The soil samples are analyzed and all the information bearing on the fertility problems of the farm is finally assembled in a soils report in which a crop and soil-management program is presented in detail. Lime and fertilizers are recommended as needed in terms of kind and quantity.

As I have walked over these farms, I have had an opportunity to see in rather an intimate way the actual conditions which exist with reference to crop production, soil fertility, maintenance, etc. The perfect set-up, where all crop land is arranged in a systematic three- or four-year rotation, with legumes occupying one-third of the land and with all the fields limed and fertilizers used in adequate amounts, is hardly ever found. In fact, I do not recall a single farm out of the 2,500 examined where this model of perfection actually exists. It is true that the crop land on many of these farms has all been limed. Most of these better farmers are using some fertilizer in the rotation and applying small amounts to the corn crop with an attachment on the corn planter.

But the thing that strikes me as I go over even the better managed and fertilized farms is the fact that there are, here and there, poor fields of corn. There are usually some outstanding fields on these farms, where the yields may run up to 75 and 80 bushels per acre. But on these same farms, frequently are found fields of corn that are short and scrubby—a patch of 5 to 10 acres on the back forty that for a variety of reasons the farmer decided at the last minute to plant to corn, but where he just didn't have enough manure to cover. It may have been an old grain

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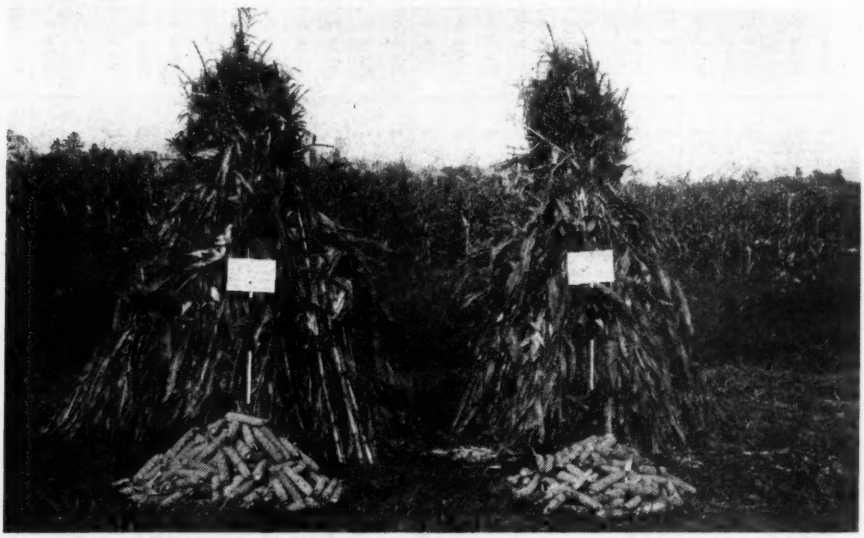

Harvested plots on the H. J. Niglis farm at Verona showing a comparison of the plow-sole treatment (700 lbs. of 8-8-8 plus 2-12-6 in hill) at the left with the check plot (2-12-6 only) at the right. Silage yield (left) was 11.8 tons per acre; (right) 8.2 tons.

Air Transport For Certain Crops

By C. B. Sherman

U. S. Department of Agriculture, Washington, D. C.

Dr. Hoecker, U.S.D.A. researcher, explains the plans for flying a shipment of lettuce from California to Detroit, Michigan, to the T. W. A. first officer, D. J. Scott. The T. W. A. hostess, Helen Peizer, notes the start of the graph-recording thermometer, attached to a crate, to register temperature changes during flight.

AIR transport for certain crops is definitely in the post-war picture. War has accelerated the use of airplanes for freight. Cessation of hostilities will bring an expansion of civilian air transport of all kinds to take up the slack and to have the benefit of this speed in business. Agriculture must be ready to get its share.

In preparation for this chance that looms on a not-distant horizon, R. W. Hoecker has been busy for the past year investigating, under actual conditions, certain perishables and scrutinizing the ifs and buts to learn rather exactly what the possibilities are for these crops under practical assumptions. He now has some rather specific facts.

Working in the United States Department of Agriculture, he has now released results in regard to tomatoes, lettuce, and strawberries. He has been assisted in this work by the airplane industry, the fruit and vegetable industry, and the Edward S. Evans Transportation Research, which is a special grant for air-cargo research. And still the work goes on. The market value of these commodities is increased by high speed of transportation and special care in handling—attributes that suggest at once an adaptability to practical air transport.

Then vegetables and fruits are particularly attractive to the airlines as air-transport possibilities because they would supply South-to-North and West-to-East cargoes to balance the opposite flow of industrial products.

In Dr. Hoecker's studies the tomatoes and strawberries originated in the vicinity of Lakeland and Miami, Florida, whereas the lettuce originated in the Salinas Valley of California. All had Detroit as destination. Only the assumptions that general readers will want to know are outlined here since reports carrying full details are now available to those who can make use of them.

Conditions

The types of airplanes used in the studies were the C-47 Transport and the C-54A Transport. The C-47, the military equivalent of the Douglas DC-3, was widely used by the commercial airlines before the war. It is supposed that these planes will be available from the military services

at lowered prices when the war is over. Ice refrigeration will not be necessary. Paper containers may well be used for tomatoes, strawberries, and lettuce. Those already manufactured for tomatoes are 3 pounds lighter than the 30-pound lug box now in use, and for lettuce the paper containers weigh 3¾ compared with the standard 10-pound wooden crate. As ripe fruit can be shipped by these speedy methods, the cost of ripening tomatoes would be saved, as well as the spoilage and waste incident to the practice.

Quality Counts

Enhancement of quality in the perishable products offered to customers on the retail market when carried in this way from the distant fields is obvious. Vine-ripened tomatoes and sun-ripened strawberries have flavor and appeal of their own. To bring strawberries from Florida to Detroit by rail express requires a minimum of 3 days and by rail freight and truck a minimum of 4 days, and tomatoes take slightly longer. By air, the time in each instance is between 6¾ and 7¾ hours. Produce may be harvested during the morning of one day, pre-cooled in the afternoon, loaded on the plane in the evening, transported overnight to the northern consuming center, and placed in retail stores the day after harvesting. The more advanced stage of natural ripening before the products are harvested means, in most cases, a considerable increase in palatability and vitamin content, and some increase in yield per acre.

When using paper containers, the cost of air transport was approximately 5½ cents more per quart for STRAWBERRIES than when they are carried by rail or truck and 5 cents more than rail express. This difference would apparently have to be covered by a difference in price charged for these better berries.

Costs versus Savings

Analyses used in this study included the estimated charges for trucking from the production center to the airport, loading the airplane, the airplane flight from airport of origin to airport of destination, unloading, trucking the cargo to the produce terminal in the city of Detroit, and unloading the produce at this terminal.

When balancing the savings to be gained by air transportation of RIPE TOMATOES against the additional cost of being flown, they are found to be about equal. Using existing air equipment and with approximately the present costs, air-transported tomatoes in paper containers can apparently be placed on retail counters at approximately the same price as those transported by surface carriers and ripened at destination.

Sales

Actual selling experience in regard to four test air shipments of the California LETTUCE was carefully checked. Inspectors found that the

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Examining a crate of lettuce flown without ice from California to Detroit, Michigan.

Can We Keep Cotton In N. C. Agriculture?

By E. R. Collins

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THERE is a growing opinion among agricultural leaders that the future of cotton in North Carolina and the Southeast does not look promising. Several factors can be pointed out to substantiate this opinion.

Cotton growers in the Southwest are turning to mechanized agriculture to lower their cost of production. They are developing and using multiple-row planters, mechanical and flame choppers, multiple-row and flame cultivators, to say nothing of cotton pickers which will reduce the cost of harvesting the crop. For example, one man driving a tractor could plant, chop, cultivate, pick the cotton, cut the stalks, and plow the land on enough acres to grow as much cotton as 20 to 30 farms in North Carolina.

The possibility of directly competing with other countries on the world market is also questioned on a price basis. Synthetic fibers are now replacing some of the cotton formerly used. Furthermore, the North Carolina farmer must use more fertilizer, which adds to his difficulty of competing with the Southwest or on the world market.

Cotton is now a basic part of the agriculture in North Carolina, and careful consideration should be given to the agricultural system before deciding to give up this crop which has been so important in the past. The livelihood of many ginners, crushers, fertilizer companies, machinery manufacturers, farm laborers, tenants, croppers, cotton pickers, etc., are at present dependent on the cotton crop. Furthermore, the budding livestock industry in North Carolina is dependent, to a considerable extent, on cottonseed meal as a high protein feed.

In contrast to the changes and mechanization reported from the Southwest, we find the following in North Carolina:

1. The manufacturers of one-mule fertilizer distributors and planters have been unable to supply the demand for present equipment in the Southeast. This demand by the farmers has tended to discourage changes in design to labor-saving equipment such as combination planters and distributors. There has been no major change to side-placement which has been shown very desirable where cotton normally receives rather high rates per acre.

2. Low-analysis fertilizers, containing much excess filler or make-weight material, continue to be popular. Wartime restrictions on low analyses have overcome some of this waste, but there is nothing to prevent returning to the old grades when conditions are normal.

3. Producing premium grade cotton offers an opportunity to put more value in the pound of cotton and overcome the disadvantages of extra expense in comparison to the Southwest. However, the marketing system frequently discourages special effort to increase quality, as much of the cotton is bought at the same price regardless of the value of the cotton.

With this background showing no changes in sight for North Carolina and the Southeast, it is well to consider some of the possibilities of lowering the cost of production and increasing the value of a pound of cotton.

More Efficient Machinery

The farming in North Carolina is done primarily on small farms or units. Tractor equipment and two-mule equip-

ment have developed considerably more than the equipment for the one-mule farmer. Until cotton pickers are developed to the point where they are practical on these small farms, cotton must be grown on small units so that the family, together with local labor, can harvest the crop.

The North Carolina Experiment Station has designed a one-mule once-over cotton planter and fertilizer distributor. This machine applies the fertilizer in bands to the side of the seed, beds, and plants with one trip to the row. This machine not only saves considerable labor over conventional methods of planting with one-mule equipment but also places the fertilizer where it will not injure stands but will still result in efficient production. This machine is about to go into production.

The effect that side-placement of fertilizer may have on the yield of cotton is shown by nine years' results from the North Carolina Experiment Station. Side-placement increased the yield 49 lbs. of lint cotton per acre in comparison to one of the best conventional methods of mixing the fertilizer with the soil before bedding. Assuming an average yield of 400 lbs. of lint per acre, the additional 49 lbs. would be an increase of 12.2%.

HIGHER ANALYSIS FERTILIZER

The Inter-Bureau Coordinating Committee on Fertilizers has shown that it costs between $10 and $11 per ton to deliver a ton of fertilizer to the farm even though it contains no plant food. This cost was shown to be due to labor, bags, outgoing freight, State tonnage tax, trucking to the farm, general overhead and profit, and dealer's commission. This cost can be further estimated from the Office of Price Administration's retail prices on fertilizers at about $12 per ton.

In 1940, the latest figures available, the filler in the average mixed fertilizer sold in North Carolina was 450 lbs. per ton (22.5%) exclusive of all secondary element material such as dolomite, keiserite, etc. With an estimated 166,800 tons of fertilizer used on cotton in 1940, 22.5% or 37,530 tons was filler. The cost of a ton of filler delivered to the farm, with no plant-food value, is shown above as $10 to $11 per ton. At the average rate of $10.50 per ton, the cotton farmers spent $394,065 for filler. That fertilizers can be made without this loss appears evident when the same report shows that the fertilizers in Maine had 10 lbs. of filler per ton, Vermont 15 lbs., etc.

That was in 1940, but there was opposition to legislating out this obvious waste by requiring a minimum of 16 units of plant food in the fertilizers. For the sake of National Defense, there is a temporary restraining regulation depriving the farmer of the privilege of buying this large amount of filler in his fertilizers. What will we do when the war is over? There appears to be a possible saving here in our cost of production.

COTTON LEAVES A RESIDUE OF OVER HALF A MILLION DOLLARS WORTH OF FERTILIZERS

Calculating the removal of nitrogen, phosphoric acid, and potash for the 727,000 bales produced in 1942, there are approximately 13,594 tons of nitrogen (N), 5,634 tons of phosphoric acid (P_2O_5), and 6,543 tons of potash (K_2O). The estimated use of fertilizers on cotton in 1942 was 9,356 tons of nitrogen, 14,178 tons of phosphoric acid, and 8,340 tons of potash.

Assuming one-half of the phosphoric acid residue available to the next crop, and two-thirds of the potash, this fertilizer left in the soil for the next crop would cost around $542,202 with 18% superphosphate at $18 per ton and 50% muriate of potash at $48 per ton. The nitrogen deficiency amounts to about 10 lbs. per acre, which would require about 500 lbs. of growth (roots and tops) from a winter legume.

What crop or crops will bear the expense of this fertilizer when cotton has been removed from the rotations in North Carolina?

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Growth response to a complete fertilizer on unmanured timothy-clover sod is striking. The plot at left received 120 lbs. of a 4-8-6 fertilizer; right, none.

Crop Fertilization or Rotation Fertilization

By M. H. McVickar and P. T. Gish[1]

Virginia Agricultural Experiment Station, Blacksburg, Virginia

THE use of chemical fertilizers probably dates from 1669 when Sir Kenelm Digby wrote that he increased the yield of crops by the application of saltpeter. However, little was understood concerning the principles of fertilization until 1804 when Nicholas Theodore de Saussure of Switzerland first directed the attention of the scientific world to the fact that ash ingredients of plants were taken from the soil and that they were, in the main, essential for plant growth.

We are aware of the tremendous advance made by agricultural workers, since the time of these two pioneers, in the fields of fertilizer manufacture and usage. The job, however, is still a complicated one; and with the best equipment and personnel available, there are many gaps in information relating to fertilizer usage. In preparing this paper the writers hope that the data presented may, in a small way, contribute to information needed on the distribution of the fertilizer within a given crop rotation.

In 1936 an experiment was initiated in the Department of Agronomy of the Virginia Agricultural Experiment Station at Staunton, Virginia, and in 1940 a similar experiment was started at Blacksburg, Virginia, to determine the effect of the distribution of the fertilizer within the crop rotation. The experi-

[1] The writers acknowledge their indebtedness to A. L. Grizzard and Ed Shulkcum under whose supervision the Blacksburg experiment was conducted.

TABLE 1.—THE EFFECT OF FERTILIZER DISTRIBUTION ON THE PRODUCTION OF CORN, WHEAT, HAY AND TOTAL DIGESTIBLE NUTRIENTS IN A FOUR-YEAR ROTATION AT STAUNTON (AVERAGE OF 1936-1943 RESULTS)

Distribution of fertilizer within rotation in pounds per acre				Average acre yields				Total digestible nutrients for all crops of rotation
Corn	Wheat	Wheat	Hay	Corn	1st yr. Wheat	2nd yr. Wheat	Mixed hay	
				Bushels	Bushels	Bushels	Pounds	Pounds
333 1/3	333 1/3	333 1/3	0	44.24	23.26	22.78	2,103	5,208.35
500	0	500	0	51.37	21.11	25.05	2,284	5,623.94
500	500	0	0	48.05	25.46	20.20	2,153	5,387.49
0	500	500	0	38.78	24.21	24.87	2,346	5,216.89
250	250	250	250	42.84	22.39	21.99	2,388	5,196.18

ments were designed to test the practicability of placing all or different proportions of the fertilizer, allotted to the rotation, to the various crops included in the particular rotations involved.

At Staunton, a four-year rotation of corn, wheat, wheat, and one year of mixed hay (clover and timothy) was established. At Blacksburg, a three-year rotation of corn, wheat, and red clover was used.

Soil conditions varied greatly between the two places. At Staunton the soil is classified as Berks silt loam, a shale-derived soil of low natural fertility and unusually poor water translocation capacity; at Blacksburg the experimental plots were located on Dunmore silt loam, a productive upland limestone soil.

At each location sufficient finely ground raw limestone was applied, prior to the experiment, to adjust the soil acidity to approximately pH 6.5. One ton of the same grade of lime was added every fourth year at Staunton and every third year at Blacksburg to maintain a favorable soil reaction. The amount and analysis of fertilizers used were in accord with agronomic recommendations. Likewise, the two rotations followed were widely used in their respective localities. Rates of seeding, spacing the rows in case of corn, time of seeding, varieties used, and methods of seeding were those in common recommended usage.

At Staunton 1,000 pounds of a 4-12-4 fertilizer were applied during the period of the four-year rotation. The distribu-

TABLE 2.—THE EFFECT OF FERTILIZER DISTRIBUTION ON THE PRODUCTION OF CORN, WHEAT, CLOVER AND TOTAL DIGESTIBLE NUTRIENTS IN A THREE-YEAR ROTATION AT BLACKSBURG (AVERAGE 1940-1943)

Distribution of fertilizer within rotation in pounds per acre			Corn	Wheat	Clover	Total digestible nutrients for all crops of rotation
Corn	Wheat	Clover				
			Bushels	Bushels	Pounds	Pounds
300	300	0	64.01	15.94	3,007.7	5,225.32
0	600	0	61.54	16.75	2,982.8	5,301.68
200	200	200	63.42	15.98	2,942.8	5,137.04
0	300	300	61.39	16.60	3,173.8	5,341.61
0	0	600	63.18	13.67	3,357.9	5,256.78

tion of this amount of fertilizer between the crops of the rotation is shown in Table 1. The method of application was as follows: Fertilizer was broadcast on corn land with a grain drill just prior to planting; wheat, put on at seeding time with a grain drill; hay, applied broadcast on the surface in early spring. The average results for eight years at Staunton are given in Table 1.

In order that the accumulative yield of crops composing the rotation could be compared, the writers have, with the aid of tables published in *Feeds and Feeding,* Twentieth Edition, by Morrison, calculated the total digestible nutrients produced for each different fertilizer-distribution rotation. These data are also given in Tables 1 and 2.

Results for four years for the Blacksburg experiment are given in Table 2. These data represent averages for two different analysis fertilizers, 0-14-6 and 4-14-6. The method of application for all crops was identical with that already described under the Staunton set-up. The amount of fertilizer applied per rotation was 600 pounds (acre basis) instead of 1,000 pounds as used at Staunton.

At Staunton, in no case did any crop receive more than 500 pounds of fertilizer to the acre; while at Blacksburg, the maximum amount applied to the corn was 300 pounds, and the other two crops received the full amount of 600 pounds—all on the acre basis.

Inasmuch as the two places selected for these experiments represent extreme differences in soil moisture-holding conditions and natural productiveness, it seems feasible to assume the results are applicable to and should serve as criteria for predicting responses for a wide range of soil and climatic conditions.

Plenty of good fertilizer applied to wheat (500 lbs. per acre in this case) produced 38 bu. of wheat and this bumper crop of clover on the farm of P. A. Delano, Heathsville, Va.

The data for both places show two distinct and separate things. In the first place, the reader's attention is called to the total digestible nutrient column of the tables. The range in total digestible nutrients for all crops of the rotation for the different fertilizer-distribution treatments is very narrow, the spread of Staunton being 427.76 T.D.N. or equivalent to about 10 bushels of corn. The largest quantity of feed units was produced when the fertilizer was applied 500 pounds to the corn and 500 pounds to the second-year wheat crop. However, when

one considers that the maximum spread in total digestible nutrients for the different fertilizer-distribution rotations is actually equivalent to about 2½ bushels of corn per acre per year, this difference for all practical purposes is not significant. The spread at Blacksburg is even less than at Staunton.

From data presented in Tables 1 and 2, it becomes evident that as far as the production of feed units is concerned, it makes little difference as to the distribution of the fertilizer within a given rotation. However, when it comes to producing maximum yields of any one particular crop, these data show an entirely different situation. At both places, the largest yields of corn were obtained from plots where this crop received the maximum proportion of the total fertilizer allotted to the rotation. At Staunton, the corn received 500 pounds of fertilizer in two different distribution treatments. Where the corn crop received 500 pounds of fertilizer and the remaining 500 pounds allotted to the rotation were applied to the second-year wheat crop, the corn yield was larger than when the corn received 500 pounds and the first wheat crop 500 pounds. Lowest corn yield came from the plot which received no fertilizer on this crop. Blacksburg data exhibit the same trend—highest corn yields when this crop received maximum fertilizer, lowest when no fertilizer was applied to this crop. The results from both places show that the farther removed the fertilizer treatment is from the corn crop, the lower the yield.

Order of wheat yields at Staunton were as follows: first year, wheat highest when this wheat crop received the maximum fertilizer application, and lowest when no fertilizer was used; second year, wheat yield was the lowest from the plot where this wheat crop received no fertilizer, and maximum yields were obtained when 500 pounds of fertilizer were applied at time of seeding the wheat. Blacksburg data are identical—highest wheat yields when this crop received all of the fertilizer, and lowest when no fertilizer was applied.

At both places, highest hay yields have been obtained from plots receiving the heaviest application of fertilizer.

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Yields of wheat in a corn-wheat-clover rotation at the Miami County Experiment Farm in Ohio show marked increases for fertilizer. Average yields for 6-year period were as follows: right, no treatment, 9.4 bushels; center, superphosphate only, 19.5 bushels; left, superphosphate and muriate of potash, 25.1 bushels.

Some Whys and Wherefores For Air-Conditioning Soils

By G. N. Hoffer

Lafayette, Indiana

WORKERS in the fields of soil physics, soil chemistry, and plant physiology are contributing much scientific and practical information on the problems involved in the adequate fertilization of corn and other crops grown in Midwestern rotations. The soil and climatic factors which affect the utilization of fertilizers applied in different ways are being evaluated and of these the role of oxygen is receiving some attention. The necessity of adequate soil aeration is becoming increasingly important when larger amounts of fertilizers and organic matter are placed deeper in the soil for various crops. In heavier textured soils some of the aeration problems may even involve the use of several minor nutrient elements to enhance the use of oxygen by the plant roots.

The depth of effective oxygen penetration into different textured soils on farms under various types of management, fertilization, and cropping history should be studied further. Also the effects of good and poor drainage, deep versus shallow plowing, subsurface tillage, discing, mulching, intermittent rainfall, and temperature changes on the availability of oxygen to the roots should be investigated. What are the effects of the decomposition products of anaerobic and aerobic decomposition of various crop residues on the roots? What chemical changes occur in the applied fertilizer materials under conditions of poor aeration? Do these decomposition products and reduced materials in poorly aerated soils become toxic to the roots or are they already damaged by a low oxygen tension which is inadequate for their respiration needs?

These are some of the problems needing attention, and it is hoped that further research interest in them, particularly on the role of oxygen in the absorption and accumulation of mineral nutrients, will be stimulated.

Root Absorption of Minerals Depends Upon Oxygen Availability

The absorption of nutrients by plants is not, as we have often thought, only a matter of permeability of root cells, but is now proven to be the result of an energy-consuming process of the protoplasm in the root cells for which oxygen is needed constantly. The oxygen used by roots was shown by Cannon (2) to be derived from either atmospheric air, dissolved in water, or produced photosynthetically in the shoots and forced into the roots as internally-supplied oxygen. The relative amounts used from each of these sources cannot be determined for any plant species. Specific capacities of different crops to supply internal oxygen to their roots determine their respective abilities to adjust themselves to the soil conditions under which various oxygen tensions prevail.

Advantages with Fertilizers in Plow Furrows

During the past several years much publicity has been directed to the deep placement of high-nitrogen fertilizers in plow furrows or onto plow-soles, for corn, soybeans, hemp, tomatoes, and other crops. Good results have been obtained with 800 to 1,200 lbs. of 8-8-8 fertilizer for corn in the light colored

soils in Indiana and on many farms throughout the Midwest. Nitrogen up to 120 lbs. per acre, with adequate phosphate and potash, has produced profitable increases in yields at rates approximating one bushel of corn per two pounds of fixed nitrogen, most of which was in the form of ammonium salts when applied.

One of the chief virtues attributed to this usage of ammonium salts placed in plow furrows, according to Scarseth, et al. (1), is the retention of the ammonium salts in a reduced condition in the deeper moist soil so that the plants may be supplied with nitrogen during droughty periods, if and when they occur during the growing season. Their experimental results show why and how cation-ammonium forms of nitrogen have superiority over the anionic-nitrates under the soil conditions studied by them. Many corn growers have obtained profitable increases from this plow-under method of using ammonium salts and complete fertilizers.

Some Soil Difficulties with Plow-furrow Fertilizers

In some heavy textured soils the problem of aeration is directly concerned with the absorption of nitrogen salts by the roots. The reduction conditions desired to maintain the supply of available nitrogen in the ammonium form for plants during dry seasons do not always favor the health and functioning of the roots in the deeper soil zones of these soils, particularly so when rainfall is abundant during the growing season.

The literature on soil aeration, oxygen tensions, and the probable role of manganese and copper in poorly aerated soils is most interesting and pertinent to these problems. A brief review of several of these contributions will help in the diagnosis of the factors affecting crops which fail to respond to fertilizers placed in the deeper soil zones.

Experiments with Barley Roots

Hoagland and Broyer (3) obtained experimental results with excised barley roots which showed that the absorption and accumulation of salts in the roots were dependent upon the energy released from sugars in the roots during aerobic respiration. Oxygen must be available to the roots to maintain these cell activities associated with the accumulation of salts and their retention over extended periods. These metabolic activities were shown to be dependent upon the oxygen-supplying power of the culture medium, upon temperature, rate of movement of carbohydrates from the shoots to the roots, as well as internal factors of cell growth. They proved definitely that salt accumulations in the roots are not merely a question of cell permeability.

Potassium Absorption Depends on Oxygen

By subjecting cultures of excised barley roots to alternate treatments with nitrogen gas and air, they (3) correlated the intake of potassium with the periods during which the roots were subjected to the oxygen in air. Little or no absorption of potassium took place during the periods when the same roots were exposed to pure nitrogen gas.

Potassium Affects Nitrate Reduction in Roots

Another item of interest in this paper (3) is the relation of the absorption and reduction of nitrates in the roots to increasing concentrations of potassium in the nutrient cultures. Nitrates were absorbed and retained as such in the roots until potassium was absorbed to an approximate equivalent of 30 m.e. per liter of sap. At this point the absorbed nitrates were rapidly reduced in the plant tissues.

Aeration Affects Absorption of Ammonium Salts

Arnon (4) compared the effects of aeration on the utilization of ammonium and nitrate nitrogen by barley plants. The growth of barley plants fertilized with ammonium salts was extensively and favorably affected by either forced aeration of the culture

solutions or by the addition of manganese, copper, and/or other metals without forced aeration. By properly adjusting the culture solutions with regard to these factors, it was possible to produce barley plants equal in growth to those supplied with nitrates. Up to 400 per cent increase in the growth of the shoots and 800 per cent increase in roots were obtained with adequate aeration of the culture solution and the proper concentration of metals in the culture solutions with ammonium salts.

Although barley only was used, Arnon's results show that the factors, such as season, hydrogen-ion concentration, oxygen supply, and content of manganese, copper, and other metals in minute quantities affect the responses of this crop to ammonium and nitrate nitrogen. All of these factors are interrelated in a complex manner, and differences in the utilization of these sources of nitrogen cannot be explained in terms of a single variable.

This paper is quite a contribution to the understanding of the general problem of utilizing ammonium and nitrate nitrogen by the higher plants and is very suggestive when his results are applied in the diagnosis of lack of responses of corn plants to heavy applications of high-nitrogen fertilizers placed in plow furrows in heavy textured soils for this crop. Perhaps one of the problems in the heavy textured soils in the Midwest may be to ascertain the value of minor elements, such as manganese and copper, when applied along with the plowed-under high-nitrogen fertilizers and organic matter.

Oxygen Determines Effectiveness of Balanced Nutrients

Shive (5), in a very comprehensive discussion of the importance of a balance of ions in nutrient cultures, featured the fact that oxygen is an important factor in the nutrition of the plant and practically determines the maximum effectiveness of the delicate dynamic balance of the nutrient elements for well-regulated growth and development of the crops.

Working with soybeans, Shive demonstrated experimentally the disastrous effects of an inadequate oxygen tension in his culture solutions for this crop. In carefully aerated cultures he found that 6 p.p.m. of dissolved oxygen in the substrate were the approximate optimum for soybeans as measured by dry weight yields; with oats, 9 p.p.m. With tomatoes the approximate optimum requirement for dissolved oxygen was 16 p.p.m. He thus showed that the optimum requirements of oxygen varied for different crops and also found that a nurtrient substrate saturated with oxygen at the equilibrium point with atmospheric air is considerably below the optimum apparently required for maximum growth of some plants.

In the low-oxygen-tension cultures, soybeans were able to utilize oxygen from reduced nitrates in the plants much more effectively than oats and tomatoes. Because of this he suggests that soybeans with a relatively low-oxygen requirement are much less severely affected by semi-anaerobic conditions than are oats and tomato plants which have relatively much higher oxygen requirements than soybeans.

The effect of the oxygen supply in the substrate for soybeans on the rates of absorption and accumulation of cation nitrogen (NH_4^+) presents a picture when graphed which is the exact opposite of that shown for the absorption and accumulation of anion nitrogen (NO_3^-). These interrelationships between oxygen tensions in the soil and the absorption of different forms of nitrogen may have a very important bearing upon agricultural production.

Detection of Soil Oxygen Deficiency

In the January 1945 issue of Better Crops With Plant Food an article titled "Fertilized Corn Plants Require Well-ventilated Soils" contains a report of observation made on corn plants that failed to respond properly to heavily-applied fertilizers in the plow furrows. By measuring the depth of oxy-

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Defective Strawberry Fruit Corrected by Borax

By L. G. Willis

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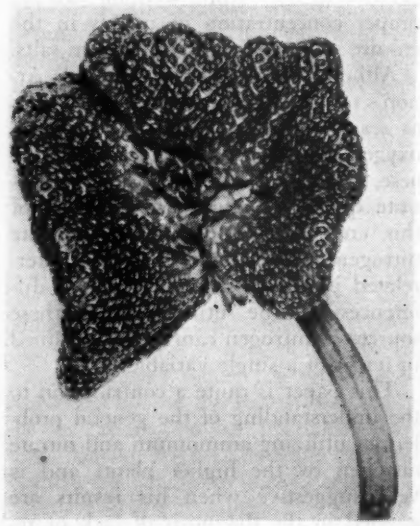
ALTHOUGH the need for boron in fertilizer is now so widely recognized that the discovery of an additional crop showing evidence of a need for this element does not merit extended discussion, the response of strawberries to borax has characteristics which may be of some fundamental as well as practical concern.

Considerable difficulty has been experienced in developing a satisfactory commercial strawberry for the South Atlantic States. The old standard varieties have been the Klondyke and the Missionary. Several years ago the Blakemore was introduced and has largely displaced other varieties. The Blakemore has, however, been subject to a troublesome yellows disease for which no remedy has been found, and persistent efforts have been made to find a satisfactory substitute.

Many crosses made by the U. S. Department of Agriculture have been tested, some of them with promising results but many, having desirable characteristics otherwise, produce fasciated fruits like those illustrated in figure 1.

The possibility of a successful remedy for this defect was suggested by an observation made in some solution culture experiments with cotton. The plants were deprived of boron in the nutrient until a deficiency of that element was evidenced by the distortion of the leaves and shortening of the internodes. Boron was then supplied and the plants resumed normal growth, except that many stems became fasciated as shown in figure 2. The most satisfactory explanation of this phenomenon seemed to be that some abnormality of



Fasciation of strawberry fruit remedied by borax.

the terminal bud short of complete death caused a fusion of cells which later developed into the multiple stem.

The fasciation of strawberry fruit could be attributed to the same cause except that there is no direct evidence of an increase in the supply of boron which would account for the recovery after an initial injury to the bud. Again, however, it is possible to draw on an earlier experience, this time with alfalfa, for an explanation of the recovery.

In the course of experiments with borax as a remedy for alfalfa "yellows," it was noted that the disease was invariably most severe in midsummer. Attempts to continue experiments during midwinter in the greenhouse failed

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Potash for Legume Pastures in Florida

By L. E. Ensminger

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THE total potassium content of most mineral soils expressed as K_2O ranges from 0.15 per cent to 4 per cent or more in the top 6 inches. A soil containing 2 per cent potash would be considered about average with regard to potassium. Certainly soils containing 0.25 per cent or less would be rated very low in potash.

Soils usually contain three forms of potassium. Most of it is generally present in a relatively insoluble form. The other two forms consist of exchangeable potassium and water-soluble potassium, both of which are considered available to plants. There is a dynamic equilibrium between the various forms of potassium, and as the available forms are used by plants or removed by leaching, the equilibrium shifts to supply more available potassium from the insoluble form. Because of the equilibrium between the insoluble form and the available forms, soils which contain a high total potassium content usually maintain a fair supply of available potassium. In general, a high total content of potash is a favorable factor for high productivity.

The virgin mineral soils in Florida which are being used for improved pastures are rather unique with respect to potassium. A number of these soils have been analyzed for exchangeable K_2O and K_2O extractable after digesting the soil sample with nitric acid and perchloric acid. The data reported in Table 1 show that in most cases the exchangeable K_2O is about equal in magnitude to the perchloric acid soluble K_2O and that both are low. Perchloric acid soluble K_2O was used as a measure of the reserve potash since the AOAC method of determining total potassium is not satisfactory for these soils. The reagents used in the AOAC method contain several times more potash as an impurity than the soils in question. According to the data, these soils contain little or no reserve potash and are therefore very likely to be deficient in available potash due to plant removal and leaching.

TABLE 1.—POTASSIUM CONTENT OF SOME VIRGIN FLORIDA SOILS

Location number	Soil type	Pounds per acre of exchangeable K_2O*	Perchloric acid soluble K_2O, pounds per acre
1	Leon f.s.**....	56.0	56.2
2	Leon f.s.....	67.2	70.0
3	Leon f.s.....	40.0	.....
4	Leon f.s.....	56.0	75.8
5	Immokalee f.s.	56.0	64.0
6	Immokalee f.s.	52.4	70.2
7	Dunbar f.s.l...	36.4	137.0

* By ammonium acetate extraction.
** f.s.—fine sand; f.s.l.—fine sandy loam.

Because of the low fertility level of the virgin mineral soils of Florida, liberal applications of phosphate and potash must be applied for the establishment of clovers. Lime must also be applied in quantities depending on the soil. According to the data in Table 2 the exchangeable potash of the surface 6 inches of a Dunbar fine sandy loam has been increased considerably as a result of potash applications. However, it should be pointed out that the last potash applications were made in No-

TABLE 2.—EFFECT OF POTASH APPLICATIONS TO A DUNBAR FINE SANDY LOAM NEAR QUINCY, FLORIDA, ON EXCHANGEABLE POTASH AND ON THE POTASSIUM CONTENT OF WHITE DUTCH CLOVER

Fertiziler treatment in pounds per acre since plots were established*			Pounds per acre of Exchangeable K_2O	Per cent K in White Dutch clover
Dolomite	Superphosphate	50 per cent Muriate of potash		
2000	1000	0	36.4	.....
2000	1000	100	49.2	1.08
2000	1000	200	65.7	1.20
2000	1000	300	66.8	1.27
2000	1000	400	80.1	1.62

* Dolomite applied in 1940, one half of superphosphate and muriate of potash applied in 1940, and the other half of each in 1942.

Note: Soil and plant samples were collected May 7, 1943. The analytical values are averages of single values of four replications.

vember 1942 and that the samples were collected before the summer rainy season. The residual exchangeable potash at the beginning of the next clover season undoubtedly would be much less as a result of leaching by the summer rains.

In the 1943 Annual Report of the Florida Experiment Station, J. D. Warner of the North Florida Experiment Station, Quincy, Florida, reported that the plots on Dunbar fine sandy loam show the necessity of applying liberal annual applications of phosphate and potash for White Dutch clover. The data presented in Table 2 on the potassium content of White Dutch clover also indicate a need for potash fertilization. The no-potash plots did not contain enough White clover to obtain a sample. Reporting on other work at Quincy, Mr. Warner stated that satisfactory growth and ground coverage of White Dutch clover were obtained only on areas receiving 400 to 600 lbs. of 18 per cent superphosphate and 200 lbs. of 50 per cent muriate of potash per acre.

The data presented in Table 3 show the need of potash for clovers in peninsular Florida. With very few exceptions, clovers can not be established successfully on the virgin flatwoods soils without the addition of at least 100 lbs. of 50 per cent muriate of potash per

TABLE 3.—AVERAGE YIELD[1] OF GREEN CLOVER IN POUNDS PER ACRE AS INFLUENCED BY POTASH

Fertilizer Treatment	Fertilized in October 1938, and one-half of initial fertilizer applied in September 1939						Relative yields, all soils
	Kissimmee		Penney farms			Samsula	
	Leon f. s.	Portsmouth f. s.	Leon f. s.	Plummer f. s.		Plummer f. s.	
	1940	1940	1940	1939	1940	1940	
(Ca + Mg) NP....	4180	840	1120	2930	490	2790	31
(Ca + Mg) NPK..	4250	6930	6270	5690	4670	11570	100

[1] Yield data collected by R. E. Blaser, Associate Agronomist.

(Ca + Mg)—1 ton lime (¾ calcic lime and ¼ dolomite)

N—75 lbs. 18 per cent nitrogen mixture per acre (½ sodium nitrate and ½ sulfate of ammonia)

P—600 lbs. 18 per cent superphosphate

K—100 lbs. 50 per cent muriate of potash

Note: Plots were seeded to a mixture of clover consisting of White Dutch, California Bur, Little Hop, Black Medic, and Persian.

Excellent White Dutch clover can be grown on light sandy soils by annual fertilization. The above field received one ton of lime and 600 lbs. of an 0-14-10 per acre when clover was established and 400 lbs. of 0-10-10 annually.

acre along with lime and phosphate. Also, clovers can not be maintained satisfactorily on these soils without annual applications of phosphate and potash.

Lespedeza likewise responds to potash but to a lesser extent than some of the clovers, such as White Dutch. The data reported in Table 4 show that about maximum yield of lespedeza was obtained on a Leon fine sand near Gainesville by the addition of 50 lbs. of potash per acre along with lime and phosphate.

Although there are few actual data available on the amount of potash required annually for the maintenance of clovers on the light sandy soils of peninsular Florida, it is generally recommended that clovers receive an annual application of 400-600 lbs. of an 0-10-10 or an 0-14-10 fertilizer. A White Dutch clover and carpet grass pasture established on a Leon fine sand near Gainesville in 1940 has received a total of 152 lbs. of K_2O to date. At the end of the 1944 clover season the soil from this field contained 64 lbs. per acre of exchangeable K_2O as compared to 56 lbs. before any fertilization. This would indicate that a potash reserve cannot be built up in these soils and, therefore, potash must be applied annually for the maintenance of clover. Since the phosphate added to the light sandy soils is not fixed to an appreciable extent, it is very probable that clovers could be maintained after the first two or three years with less phosphorus; in which case an 0-8-24 or similar grade of fertilizer at the rate of 250 lbs. per acre

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TABLE 4.—RESPONSE OF LESPEDEZA[1] TO POTASH ON A VIRGIN LEON FINE SAND NEAR GAINESVILLE

Fertilizer treatment, pounds per acre			Dry weight in pounds per acre
Lime	Superphosphate	50 per cent Muriate of potash	
2000	450	0	604
2000	450	50	999
2000	450	100	1045

[1] Data collected by R. E. Blaser, Associate Agronomist.

Note: The virgin soil contained 56 lbs. per acre of exchangeable K_2O.

Fish for Health, Recreation, and Politics

By L. O. Brackeen

Editor, Extension Service, Auburn, Alabama

IN one afternoon 63 of us caught 368 edible-size breams and 32 one-pound yearling bass in an 8-acre pond belonging to the Wedowee Outing Club. Too, we had an excellent picnic supper and a most enjoyable get-together in the evening.

The fish were caught by farmers, bankers, lawyers, doctors, druggists, merchants, county officials, teachers, boys and girls living in and near Wedowee, the county seat of rural Randolph County, Alabama. Ages of those fishing ranged from seven to 70 years with many of them fishing for the first time in their lives.

"This is the first fish I ever caught in my life," shouted Mrs. H. T. Burns to her husband as she yanked her first bream from the pond. Looking around she saw Mr. Burns landing the first trout he had caught in 20 years. A friendly argument followed as to which one caught the first fish, but this was soon forgotten as each proceeded to catch the legal limit of 15.

Before the afternoon passed, members of 23 families joined in the fishing. As they gathered around the picnic supper, everybody was most enthusiastic over the new fish pond, the only fishing place in the county except the muddy Tallapoosa River.

"This is one of the greatest things that has ever happened in our county," said Probate Judge H. M. Brittain, in explaining that 30 members of a new fishing club had made it possible for the pond to be open "from now on" for fishing, swimming, picnicking, and camping by members, their families, and guests. "We all need to know each other better and this gives us an opportunity to do that very thing. Too, our young and old alike will use this pond for their recreational outings without having to travel long distances as has been the case in the past."

These facts are given as an example of the interest being manifested by both rural and urban residents in fish-pond construction and maintenance. Latest reports indicate that more than 200,000 ponds have been built for livestock water, recreation, fishing, and irrigation and that thousands of others are being constructed annually. In building ponds, farmers, ranchers, and others are following scientific facts and expert advice.

Results of Fertilizer

Four years ago the writer revealed that the Agricultural Experiment Station, Alabama Polytechnic Institute, had found how to produce 600 pounds of fish per acre of pond water by properly stocking the water with fish and fertilizing it with a complete cotton fertilizer. It is now my privilege to report that ponds are not only being used for producing fish but are playing an important part in helping solve many social, recreational, and dietary problems. Many ponds are being constructed for use by sons and daughters and their friends following the war, while others are being used for political purposes.

After talking with a large number of pond owners and operators, I am convinced that A. M. Pearson, API wildlife specialist, is correct when he says that "ponds are bringing rural and urban residents closer together with each group coming to a better knowledge of each other's problems."

At one pond a farmer, a banker, and

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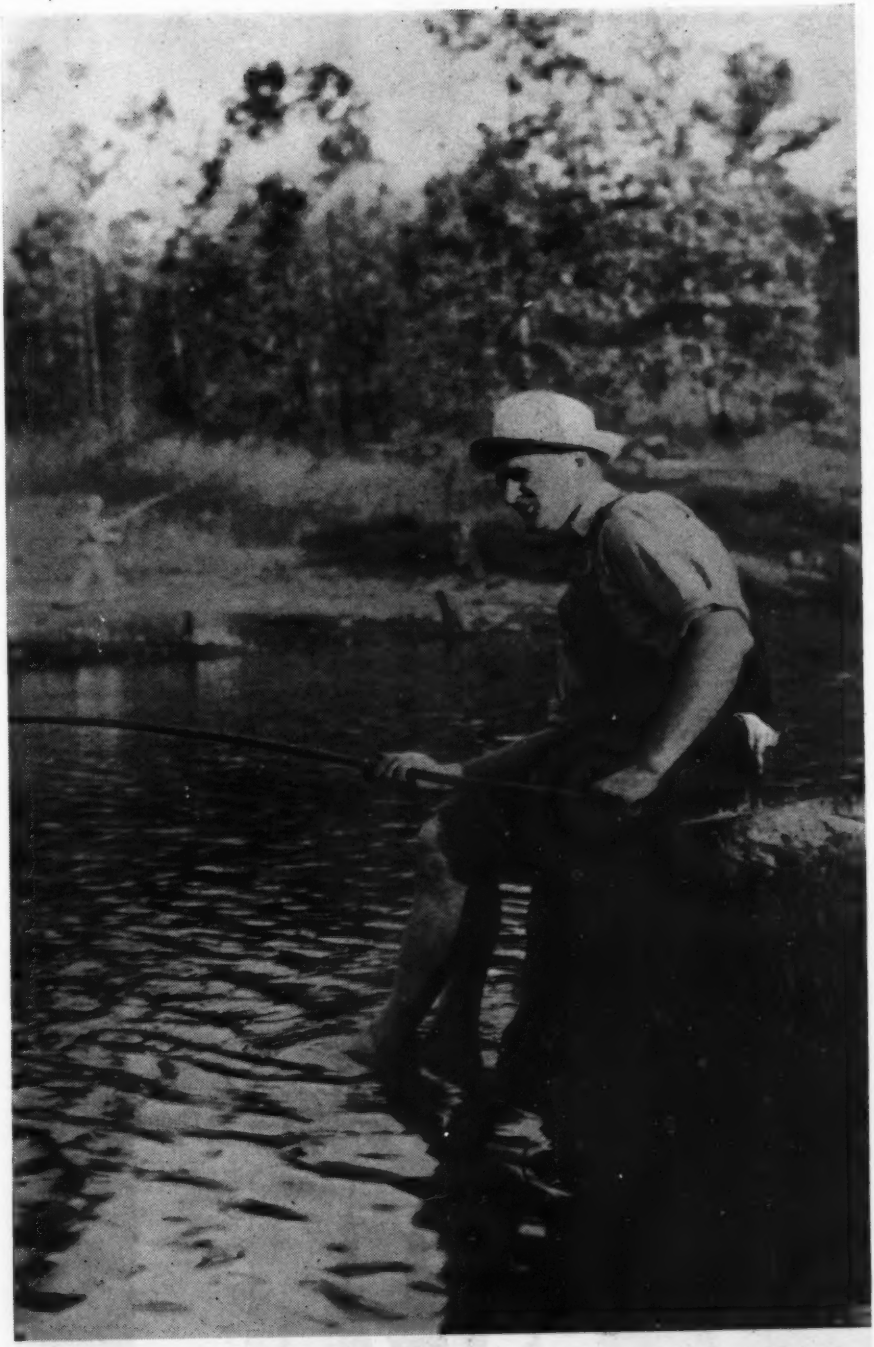

Otis Harry, Wedowee, Alabama, enjoying an afternoon of fishing in a well-fertilized fish pond.

Above: **N. D. Burson, druggist, Wedowee, holding string of fish caught in pond on opening day of Wedowee Outing Club.**

Below: **Betty Ann Wright, Betty Hendon, Emilu Yarbrough, Sarah Fay Perry, and Virginia Hendon, holding string of bream they caught.**

Above: **Group enjoying picnic supper following afternoon of fishing. Notice James Murphy Mostellar, Jr., with his bottle.**

Below: **Peggy Armstrong, Beckie and Bootie Williams with fish they caught in a pond in the pasture of C. B. Williams, Thompson, Alabama.**

Above: One of Alabama's 3,500 farm fish ponds. This one is located in the pasture of J. T. Stoudemire, Lowndesboro.

Below: Cattle and mules grazing on Mr. Williams' pasture. Water in the trough was piped from a nearby fish pond.

The Editors Talk

Dr. J. A. Bizzell
Dr. D. E. Haley

It is with deepest regreat that we record the passing of Dr. J. A. Bizzell of Cornell University and Dr. D. E. Haley of Pennsylvania State College—Soil Scientists who had attained national and international reputations in their field.

Professor "Jimmie" Bizzell passed away on November 1 at his home near Ithaca, New York, after more than forty years of active service during which he gave generously of his time and energy to all who sought his counsel in the intricate problems involved in a better understanding of how the soil works. His numerous contributions to the literature on soils and soil chemistry have been a source of inspiration to untold numbers of research workers as well as students whose privilege it was to know him and to acquire something of his philosophy of service through science.

Dr. Haley died on February 10 after a brief illness at his home in State College, Pennsylvania. Associated with the College since 1914, he had come to be regarded as an international authority on tobacco and tobacco quality. His research with cigaret and cigar leaf tobacco for the U. S. Government extended over a period of twenty-five years. His several articles which have appeared in this magazine pointed out the importance of proper fertilization of the soil in achieving the desired quality in tobacco.

The loss of such scientists will be keenly felt, not only for their wealth of knowledge gained from long years of experience but for their inspiration to younger research workers. Because of them, American agriculture has advanced beyond the point where it first attracted their life interests.

Can the Southeast Compete in Cotton?

Like other industries in their post-war planning, agriculture is surveying its capabilities in the light of competitive forces which will arise through new developments and trends in production, marketing, and demand. An excellent example of the careful thought being given to these problems is to be found in the article "Can We Keep Cotton in North Carolina's Agriculture?" by Dr. E. R. Collins in this issue.

Dr. Collins poses the problem in his opening sentence: "There is a growing opinion among agricultural leaders that the future of cotton in North Carolina and the Southeast does not look promising." He then gives the reasons for this opinion—the lower cost of production attained by the cotton growers in the Southwest, the inroads of synthetic fibers, and the competition on the world market on a price basis. He points out the basic role which cotton has played in the agriculture of the Southeast and the livelihood of the many ginners, crushers,

fertilizer companies, machinery manufacturers, farm laborers, tenants, croppers, cotton pickers, et al.

Looking where one must, always look for a foundation for improvement—at one's own faults—he lists the lack of labor-saving equipment, the continued use of low-analysis fertilizers, and the failure to produce premium grade cotton as the most likely stumbling blocks to meeting competition. After discussing each he concludes that keeping cotton in North Carolina may be a hard fight, but, he says, "Better adapted machinery, higher analysis fertilizers, realizing that cotton fertilizers leave a residue for the next crop, better fertilization, growing better quality of cotton for premium price, giving the farmer the value of his cotton when properly produced, and recognizing the value of locally produced cottonseed meal, all add up to things that can be done to keep cotton in North Carolina. Will they be done and who will do them?"

His concluding sentence is a challenge, a challenge to everyone interested in the agriculture of the Southeast. The efforts which will be put forth to meet this as well as the problems confronting other industries will decide whether our post-war years are to be ones of prosperity or depression.

Extending Education

One of the big reasons why American agriculture has met its huge wartime food goals is to be found in the "Report of Cooperative Extension Work in Agriculture and Home Economics, 1944" by M. L. Wilson, Director, to Marvin Jones, Administrator, War Food Administration. There can be no doubt of the important role which the Extension Service has played in the war effort when one notes the wartime educational responsibility on food production which was assigned to it. This responsibility, in the words of the Report, "meant giving to the masses of the rural people the latest information on 'how to do it'; keeping them informed about wartime agricultural regulations; advising them of the national needs of farm production; supplying information to War Boards and Selective Service Boards on draft deferments; organizing emergency production and preservation programs; assisting with fire-control programs; organizing and directing the vast farm-labor program; helping to control disease and insects; assisting with war bond and salvage drives; cooperating in the 8-point milk-production program; and scores of other activities."

The program involved 5 million farm families and more than 3 million nonfarm rural families. The tremendous education job required teamwork, and the leadership of the county activities fell largely upon the shoulders of the County Extension Agents. They were assisted by specialists in the Federal and State Extension Services and by thousands of unpaid volunteer neighborhood leaders trained over a period of years by the extension services.

"Extension" commemorated its thirtieth anniversary on July 1, 1944. With these years of experience and proven worth, it should prove a vital force in shaping our agriculture in the years ahead. Director Wilson says, "The need for rural education after the war will be greater than ever before. Soldiers returning to the soil, fading war emergency markets, conservation of overworked soils, protection of the health of farm people, the necessity for improving rural living conditions—all these problems and their solution call for understanding by the people. Extension agents will be called upon to help farmers understand and meet these problems. As one small indication of what lies ahead, the Extension Service already has been given the responsibility of serving in an advisory capacity in helping to relocate war veterans who wish to return to farming. Other responsibilities will follow."

Farm Prices of Farm Products*

	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
1910–14 Average	12.4	10.4	69.6	87.6	64.8	88.0	11.94	21.59	....
1920	32.1	17.3	249.5	175.7	144.2	224.1	21.26	51.73	....
1921	12.3	19.5	103.8	118.7	58.7	119.0	12.96	22.18	....
1922	18.9	22.8	96.7	104.8	58.5	103.2	11.68	35.04	....
1923	26.7	19.0	84.1	104.4	80.1	98.9	12.29	43.69	....
1924	27.6	19.0	87.0	137.0	91.2	110.5	13.28	38.34	....
1925	22.1	16.8	113.9	171.6	99.9	151.0	12.54	35.07	....
1926	15.1	17.9	185.7	156.3	69.9	135.1	13.06	27.20	....
1927	15.9	20.7	132.3	114.0	78.8	120.5	12.00	28.56	....
1928	18.6	20.0	82.9	112.3	89.1	113.4	10.63	37.70	....
1929	17.7	18.6	93.7	118.4	87.6	102.7	11.56	34.98	....
1930	12.4	12.9	124.4	115.8	78.0	80.9	11.31	26.25	....
1931	7.6	8.2	72.7	92.9	49.8	48.8	9.76	17.04	....
1932	5.8	10.5	43.3	57.2	28.1	38.8	7.53	9.74	....
1933	8.1	12.9	66.0	59.4	36.5	58.1	6.81	12.32	....
1934	12.0	17.1	68.0	79.1	61.3	79.8	10.67	26.12	....
1935	11.6	16.1	49.4	73.9	77.4	86.4	10.57	35.56	....
1936	11.7	17.2	99.6	85.3	76.7	96.0	8.93	31.78	....
1937	11.1	19.9	88.3	91.8	94.8	107.1	10.36	30.24	....
1938	8.3	17.2	55.5	76.9	49.0	66.1	7.55	21.13	....
1939	8.7	13.6	68.1	75.4	47.6	63.6	6.95	22.17	....
1940	9.6	15.1	70.7	85.2	59.0	73.9	7.62	24.31	....
1941	13.3	19.1	64.6	94.4	64.3	84.0	8.10	35.04	....
1942	18.51	28.3	110.0	108.3	79.5	101.8	10.05	44.42	....
1943	19.84	32.5	149.2	196.7	102.7	127.3	12.82	48.26	....
1944									
January	20.15	41.5	141.0	202.0	113.0	146.0	15.70	52.80	....
February	19.93	25.1	139.0	211.0	113.0	146.0	15.90	52.60	....
March	19.97	21.9	137.0	220.0	114.0	146.0	16.00	52.70	....
April	20.24	23.8	137.0	229.0	115.0	147.0	16.20	52.50	....
May	19.80	37.2	134.0	236.0	115.0	147.0	16.10	52.50	....
June	20.16	49.2	125.0	233.0	115.0	143.0	15.00	52.80	....
July	20.32	45.0	138.0	230.0	117.0	139.0	13.90	53.00	....
August	20.15	39.3	159.0	258.0	117.0	135.0	14.30	53.20	....
September	21.02	42.9	147.0	219.0	116.0	135.0	14.70	52.30	....
October	21.25	41.2	142.0	185.0	113.0	142.0	15.20	52.70	....
November	20.78	45.1	143.0	164.0	106.0	143.0	15.60	53.40	....
December	20.85	43.5	150.0	175.0	106.0	145.0	16.50	53.10	....
1945									
January	20.20	41.9	158.0	190.0	107.0	146.0	17.10	52.80	....
Index Numbers (1910-14 = 100)									
1920	259	166	358	201	223	255	178	240	....
1921	99	187	149	136	91	135	109	103	....
1922	152	219	139	120	90	117	98	162	....
1923	215	183	121	119	124	112	103	202	....
1934	223	183	125	156	141	126	111	177	159
1925	178	161	164	196	154	172	105	162	153
1926	122	172	267	178	108	154	109	126	143
1927	128	199	190	130	122	137	101	132	121
1928	150	192	119	128	138	129	89	174	159
1929	143	179	135	135	135	117	97	162	149
1930	100	124	179	132	120	92	95	122	140
1931	61	79	104	106	77	55	82	79	117
1932	47	101	62	65	43	44	63	45	102
1933	65	124	95	68	56	66	57	57	105
1934	97	164	98	90	95	91	89	121	004
1935	94	155	71	84	119	98	89	165	126
1936	94	165	143	97	118	109	75	147	113
1937	90	191	127	105	146	122	87	140	122
1938	67	165	80	88	76	75	63	98	101
1939	70	131	98	86	73	72	58	103	109
1940	78	145	102	97	91	84	64	126	121
1941	107	184	93	108	99	95	68	162	145
1942	149	272	158	124	123	116	84	206	199
1943	160	313	214	225	158	145	107	224	245
1944									
January	163	399	203	231	174	166	131	245	231
February	161	241	200	241	174	166	133	244	204
March	161	211	197	251	176	166	134	244	191
April	163	229	197	261	177	167	136	243	184
May	160	358	193	269	177	167	135	243	217
June	163	473	180	266	177	163	126	245	245
July	164	433	198	263	181	158	116	245	236
August	163	378	228	295	181	153	120	246	253
September	170	413	211	250	179	153	123	242	239
October	171	396	204	211	174	161	127	244	192
November	168	434	205	187	164	163	131	247	188
December	168	418	216	200	164	165	138	246	228
1945									
January	163	403	227	217	165	166	143	245	262

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Fish scrap, wet acidulated 6% ammonia, 3% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.05	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	3.54	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.25	4.59	5.16
1924	2.99	2.44	5.87	5.02	4.41	3.60	4.25
1925	3.11	2.47	5.41	5.34	4.70	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.15	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.35	4.32	5.70
1928	2.67	2.30	7.06	6.63	5.28	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.69	4.61	5.72
1930	2.47	1.81	4.78	4.96	4.15	3.79	4.58
1931	2.34	1.46	3.10	3.95	3.33	2.11	.46
1932	1.87	1.04	2.18	2.18	1.82	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.58	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.84	2.67	3.27
1935	1.47	1.15	4.59	3.10	2.65	3.06	3.65
1936	1.53	1.23	4.17	3.42	2.67	3.58	4.25
1937	1.63	1.32	4.91	4.66	3.65	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.17	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.12	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.35	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.27	3.76	4.43
1942	1.74	1.41	6.11	5.77	3.34	5.04	6.76
1943	1.75	1.42	6.30	5.77	3.34	4.86	6.62
1944							
January	1.75	1.42	7.40	5.77	3.34	4.86	6.71
February	1.75	1.42	7.40	5.77	3.34	4.86	6.71
March	0.75	1.42	7.40	5.77	3.34	4.86	6.71
April	1.75	1.42	7.50	5.77	3.34	4.86	6.71
May	1.75	1.42	7.81	5.77	3.34	4.86	6.71
June	1.75	1.42	7.81	5.77	3.34	4.86	6.71
July	1.75	1.42	7.81	5.77	3.34	4.86	6.71
August	1.75	1.42	7.81	5.77	3.34	4.86	6.71
September	1.75	1.42	7.81	5.77	3.34	4.86	6.71
October	1.75	1.42	7.81	5.77	3.34	4.86	6.71
November	1.75	1.42	7.81	5.77	3.34	4.86	6.71
December	1.75	1.42	7.81	5.77	3.34	4.86	6.71
1945							
January	1.75	1.42	7.81	5.77	3.34	4.86	6.71
Index Numbers (1910-14 = 100)							
1922	113	90	173	132	117	140	142
1923	112	102	177	137	140	136	147
1924	111	86	168	142	145	107	121
1925	115	87	155	151	155	117	135
1926	113	84	126	140	146	129	139
1927	112	79	145	166	143	128	162
1928	100	81	202	188	173	146	170
1929	96	72	161	142	154	137	162
1930	92	64	137	141	136	12	130
1931	88	51	89	112	109	63	70
1932	71	36	62	62	60	36	39
1933	59	39	84	81	85	97	71
1934	59	42	127	89	93	79	93
1935	57	40	131	88	87	91	104
1936	59	43	119	97	89	106	131
1937	61	46	140	132	120	120	122
1938	63	48	105	106	104	93	100
1939	63	47	115	125	102	115	111
1940	63	48	133	124	110	99	96
1941	63	49	157	151	107	112	126
1942	65	49	175	163	110	150	192
1943	65	50	180	163	110	144	189
1944							
January	65	50	211	163	110	144	191
February	65	50	211	163	110	144	191
March	65	50	211	163	110	144	191
April	65	50	214	163	110	144	191
May	65	50	223	163	110	144	191
June	65	50	223	163	110	144	191
July	65	50	223	163	110	144	191
August	65	50	223	163	110	144	191
September	65	50	223	163	110	144	191
October	65	50	223	163	110	144	191
November	65	50	223	163	110	144	191
December	65	50	223	163	110	144	191
1945							
January	65	50	223	163	110	144	191

Wholesale Prices of Phosphates and Potash**

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]	Kainit 20% bulk, per unit, c.i.f. Atlantic and Gulf ports
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657	$0.655
1922	.566	3.12	6.90	.632	.904	23.87	....	.508
1923	.550	3.08	7.50	.588	.836	23.32	....	.474
1924	.502	2.31	6.60	.582	.860	23.72	....	.472
1925	.600	2.44	6.16	.584	.860	23.72	....	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537	.524
1927	.525	3.09	5.50	.646	.924	25.55	.586	.581
1928	.580	3.12	5.50	.669	.957	26.46	.607	.602
1929	.609	3.18	5.50	.672	.962	26.59	.610	.605
1930	.542	3.18	5.50	.681	.973	26.92	.618	.612
1931	.485	3.18	5.50	.681	.973	26.92	.618	.612
1932	.458	3.18	5.50	.681	.963	26.90	.618	.591
1933	.434	3.11	5.50	.662	.864	25.10	.601	.565
1934	.487	3.14	5.67	.486	.751	22.49	.483	.471
1935	.492	3.30	5.69	.415	.684	21.44	.444	.488
1936	.476	1.85	5.50	.464	.708	22.94	.505	.560
1937	.510	1.85	5.50	.508	.757	24.70	.556	.607
1938	.492	1.85	5.50	.523	.774	15.17	.572	.623
1939	.478	.190	5.50	.521	.751	24.52	.570	.670
1940	.516	.190	5.50	.517	.730	24.75	.573	....
1941	.547	1.94	5.64	.522	.780	25.55	.570	....
1942	.600	2.13	6.29	.522	.810	25.74	.205	....
1943	.631	2.00	5.93	.522	.786	25.35	.195	....
1944								
January	.640	2.00	6.10	.535	.797	26.00	.200	....
February	.640	2.00	6.10	.535	.797	26.00	.200	....
March	.640	2.00	6.10	.535	.797	26.00	.200	....
April	.640	2.00	6.10	.535	.797	26.00	.200	....
May	.640	2.00	6.10	.535	.797	26.00	.200	....
June	.640	2.00	6.10	.471	.701	22.88	.176	....
July	.646	2.16	6.10	.503	.749	24.44	.188	....
August	.650	2.20	6.10	.503	.749	24.44	.188	....
September	.650	2.20	6.10	.503	.749	24.44	.188	....
October	.650	2.20	6.10	.535	.797	26.00	.200	....
November	.650	2.20	6.10	.535	.797	26.00	.200	....
December	.650	2.20	6.10	.535	.797	26.00	.200	....
1945								
January	.650	2.20	6.10	.535	.797	26.00	.200	....
Index Numbers (1910-14 = 100)								
1922	106	87	141	89	95	99	....	78
1923	103	85	154	82	88	96	....	72
1934	94	64	135	82	90	98	....	72
1925	110	68	126	82	90	98	....	74
1926	112	88	114	83	90	98	82	80
1927	100	86	113	90	97	106	89	89
1928	108	86	113	94	100	109	92	92
1929	114	88	113	94	101	110	93	92
1930	101	88	113	95	102	111	94	93
1931	90	88	113	95	102	111	94	93
1932	85	88	113	95	101	111	94	90
1933	81	86	113	93	91	104	91	86
1934	91	87	110	68	79	93	74	72
1935	92	91	117	58	72	89	68	75
1936	89	51	113	65	74	95	77	85
1937	95	51	113	71	79	102	85	93
1938	92	51	113	73	81	104	87	95
1939	89	53	113	73	79	101	87	93
1940	96	53	113	72	77	102	87	....
1941	102	54	110	73	82	106	87	....
1942	112	59	129	73	85	106	84	....
1943	117	55	121	73	82	105	83	....
1944								
January	119	55	125	75	84	108	83	....
February	119	55	125	75	84	108	83	....
March	119	55	125	75	84	108	83	....
April	119	55	125	75	84	108	83	....
May	119	55	125	75	84	108	83	....
June	119	55	125	66	74	95	80	....
July	121	60	125	70	79	101	82	....
August	121	61	125	70	79	101	82	....
September	121	61	125	70	79	101	82	....
October	121	61	125	75	84	108	83	....
November	121	61	125	75	84	108	83	....
December	121	61	125	75	84	108	83	....
1945								
January	121	61	125	75	84	108	83	....

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer materials‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash
1922.....	132	149	141	116	101	145	106	85
1923.....	143	152	147	114	107	144	103	79
1924.....	143	152	143	103	97	125	94	79
1925.....	156	156	151	112	100	131	109	80
1926.....	146	155	146	119	94	135	112	86
1927.....	142	153	139	116	89	150	100	94
1928.....	151	155	141	121	87	177	108	97
1929.....	149	154	139	114	79	146	114	97
1930.....	128	146	126	105	72	131	101	99
1931.....	90	126	107	83	62	83	90	99
1932.....	68	108	95	71	46	48	85	99
1933.....	72	108	96	70	45	71	81	95
1934.....	90	122	109	72	47	90	91	72
1935.....	109	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	122	131	126	81	50	129	95	75
1938.....	97	123	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	131	127	86	56	130	102	77
1942.....	159	152	144	93	57	161	112	77
1943.....	192	167	150	94	57	160	117	77
1944								
January...	196	174	150	96	57	171	119	78
February..	195	175	151	96	57	171	119	78
March.....	196	175	151	96	57	171	119	78
April.....	196	175	152	96	57	172	119	78
May.....	194	175	152	97	57	175	119	78
June.....	193	176	151	95	57	175	119	69
July.....	192	176	152	96	57	175	121	74
August....	193	176	151	96	57	175	121	74
September.	192	176	151	96	57	175	121	74
October...	194	176	152	97	57	175	121	78
November.	196	177	152	97	57	175	121	78
December..	200	178	152	97	57	175	121	78
1945								
January...	201	179	153	97	57	175	121	78

* U. S. D. A. figures.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning with June 1941, manure salts prices are F. O. B. mines, the only basis now quoted.

**** The annual average of potash prices is higher than the weighted average of prices actually paid because since 1926 better than 90% of the potash used in agriculture has been contracted for during the discount period. From 1937 on, the maximum seasonal discount has been 12%.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizer Recommendations for Wartime in Arkansas," Ext. Serv., Univ. of Ark., Fayetteville, Ark., W. E. Publ. 4, 1944-45, C. F. Simmons and E. J. Allen.

"Fertilizer Shipments in Arkansas by Counties for the Fiscal Year Ending June 30, 1944," Dept. of Revenues, State of Ark., Little Rock, Ark.

"Growth Status of the Cotton Plant as Influenced by the Supply of Nitrogen," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., June 1944, Bul. 446, C. H. Wadleigh.

"Comparison of Mixed Fertilizers Produced from Various Nitrogen and Phosphoric Acid Sources," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 450, R. P. Bartholomew.

"Commercial Fertilizer Usage in Delaware During Wartime," Agr. Exp. Sta., Univ. of Dela., Newark, Dela., Pamph. 18, Dec. 1944, H. A. Johnson and J. F. Davis.

"1944 Wartime Fertilizer Recommendations for Idaho," College of Agr., Univ. of Idaho, Moscow, Idaho, War Cir. 36, H. W. E. Larson and G. O. Baker.

"Commercial Feeds, Fertilizers and Agricultural Liming Materials," Regulatory Service, College Park, Md., No. 191 Control Series, Aug. 1944.

"Inspection of Commercial Fertilizers and Agricultural Lime Products," Agr. Exp. Sta., Mass. State College, Amherst, Mass., Bul. 122, Sept. 1944, P. H. Smith.

"Fertilize Victory Wise in 1945," College of Agr., Cornell Univ., Ithaca, N. Y., War E. Bul. 121, Bul. 661, Dec. 1944, E. L. Worthen.

"Fertilizing Vegetables in 1945," Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 662, W. E. Bul. 122, Dec. 1944, G. J. Raleigh and R. D. Sweet.

"Report of Analyses of Commercial Fertilizers and Lime Materials Sold in New York State," Dept. of Agr. & Markets, Albany, N. Y., Bul. 347, June 1944.

"Fertilizing Farm Crops in 1945," Agr. Ext. Serv., Pa. State College, State College, Pa.

"Inspection and Analysis of Commercial Fertilizers," Agr. Exp. Sta., Agr. College, Clemson, S. C., Bul. 353, Dec. 1944, H. J. Webb.

"Commercial Fertilizers in 1943-44," Agr. Exp. Sta., A. & M. College of Texas, College Station, Texas, Bul. 662, Oct. 1944, G. S. Fraps and T. L. Ogier.

"Lime for Health," Agr. Exp. Sta., W. Va. Univ., Morgantown, W. Va., Cir. WS 21, Aug. 1944.

Soils

"Arizona Range Resources and Their Utilization—I. Cochise County," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., T. Bul. 103, Oct. 1944, R. A. Darrow.

"Conservation Farming Keeps Your Soil Producing," Ext. Serv., Univ. of Ky., Lexington, Ky., Leaf. 71, March 1944.

"Soil Tests for Lime and Fertilizer," Ext. Serv., Univ. of Ky., Lexington, Ky., Leaf. 74, April 1944, P. E. Karraker.

"Soil Fertility Practices for Cotton Production: Schaefer Field, Yazoo County," Agr. Exp. Sta., Miss., State College, State College, Miss., S. S. 378, Aug. 1944, John Pitner.

"Summer Fallow in Nebraska," Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Bul. 362, Aug. 1944, L. L. Zook and H. E. Weakley.

"Irrigating Vegetables," College of Agr., Cornell Univ., Ithaca, N. Y., Bul. 647, May 1944, C. N. Turner and G. J. Raleigh.

"Lysimeter Experiments—VI—The Effects of Cropping and Fertilization on the Losses of Nitrogen from the Soil," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., Mem. 256, March 1944, J. A. Bizzell.

"Saline Soils—Their Nature and Management," U.S.D.A., Washington 25, D. C., Cir. 707, Sept. 1944, O. C. Magistad and J. E. Christiansen.

"Physical Land Conditions in the Western and Southeastern Baca County Soil Conservation Districts Colorado," U.S.D.A., Washington, D. C., Phys. Land Survey No. 30, J. J. Underwood.

Crops

"Ponds for Improving Stream Fishing," Agr. Exp. Sta., Ala. Polytechnic Inst., Auburn, Ala., Leaf. 29, June 1944, E. V. Smith and H. S. Swingle.

"Food Crops for Game Birds on Farm Lands," Agr. Exp. Sta., Ala. Polytechnic Inst.,

Auburn, Ala., Cir. 90, June 1944, A. M. Pearson and D. G. Sturkie.

"Greater Production Through Research," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., 55th A. R., 1943, Bul. 443, June 1944.

"Seed Treatment with Plant Hormones in Crop Production," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 444, June 1944, R. P. Bartholomew.

"Rotation, Cultural, and Irrigation Practices Affecting Rice Production," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 445, June 1944, Martin Nelson.

"Maintenance of Alfalfa Stands," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 447, June 1944, Martin Nelson.

"Peanut Production Experiments, 1931-41," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 448, June 1944, C. K. McClelland.

"Effect of the Use of Winter Legumes on Yields of Cotton, Corn, and Rice," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 451, Martin Nelson.

"Report of the Minister of Agriculture for the Dominion of Canada for the Year Ended March 31, 1944," Ottawa, Canada.

"Herbs for Florida," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Press Bul. 600, Oct. 1944, R. J. Wilmot.

"Wartime Agricultural Research," 51st A. R., Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Bul. 255, July 1944.

"Report of Branch Experiment Station," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Cir. 94, July 1944, C. W. Hungerford.

"Dixon Springs Experiment Station, What It Is Doing to Develop Agriculture in Southern Illinois," Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 586, Oct. 1944, H. P. Rusk, W. L. Burlison, R. F. Fuelleman, W. G. Kammlade, and R. J. Webb.

"Twenty-seventh Annual Report of the Ill. State Dept. of Agr.," Ill. State Dept. of Agr., Springfield, Ill., July 1, 1943 to June 30, 1944.

"Strawberries for the Iowa Home Garden," Ext. Serv., Iowa State College, Ames, Iowa, Pamph. 83, Jan. 1944.

"Recommendations for the Control of Wildfire and Angular Leafspot of Burley Tobacco," Ext. Serv., Univ. of Ky., Lexington, Ky., Leaf. 58, Nov. 1943, W. D. Valleau, E. M. Johnson, and R. A. Hunt.

"Your Vegetable Garden," Ext. Serv., Univ. of Ky., Lexington, Ky., Leaf. 61, Dec. 1943.

"Produce More Corn," Ext. Serv., Univ. of Ky., Lexington, Ky., Leaf. 66, Feb. 1944.

"Grapes for the Home," Ext. Div., Univ. of Ky., Lexington, Ky., Leaf. 72, March 1944, A. J. Olney.

"Priming Burley Tobacco," Ext. Div., Univ. of Ky., Lexington, Ky., June 1944, R. A. Hunt.

"Sow Small Grain on Lespedeza Fields for Pasture," Ext. Div., Univ. of Ky., Lexington, Ky., Leaf. 82, Aug. 1944, Ralph Kenney.

"Newthatch Wheat," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., T. Bul. 166, June 1944, E. R. Ausemus, E. C. Stakman, E. W. Hanson, W. F. Geddes, and P. P. Merritt.

"Growing Raspberries for Home Use," Ext. Div., Univ. of Minn., St. Paul, Minn., Bul. 206, Rev. June 1944, E. M. Hunt.

"Cabbage Variety Trials: Truck Crops Branch Station, 1939-44," Agr. Exp. Sta., Miss. State College, State College, Miss., Inf. Sheet. 320, Sept. 1944, E. L. Moore and J. A. Campbell.

Economics

"Citrus Production Costs 1943," Ext. Serv., Univ. of Calif., Los Angeles 12, Calif.

"Ventura County Citrus Orchard Management Study—Lemons 1943," Agr. Ext. Serv., Univ. of Calif., Office of Farm Advisor, Ventura, Calif., Sept. 1944, B. B. Burlingame.

"Settlement Problems in Northern New Brunswick," Dom. of Canada, Dept. of Agr., Ottawa, Canada, Publ. 764, T. Bul. 51, Dec. 1944, A. Gosselin and G. P. Boucher.

"Regulations Governing the Production and Sale of Canadian Certified Seed Potatoes," Dept. of Agr., Science Serv., Plant Protection Div., Ottawa, Canada.

"Connecticut Vegetable Acreages 1942-1943-1944," Dept. of Agr., Hartford, Conn., Bul. 87, Dec. 1944.

"Range Land Objectives and Problems in the Postwar Period for Idaho," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Cir. 93, Sept. 1944.

"Some Post-war Problems, Policies, and Procedures for Indiana Agriculture," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Bul. 497, Sept. 1944.

"Seasonal Price Movements of Fire-cured Tobacco in Kentucky," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Bul. 460, April 1944, C. M. Clark, W. C. Binkley, and D. M. Pettus.

"Farming as a Business," Ext. Div., Univ. of Ky., Lexington, Ky., Cir. 401, June 1944, Lawrence A. Bradford.

"What's Ahead in Farm Production, Prices and Costs?" Agr. Exp. Sta., Mich. State College, East Lansing, Mich., F. M. 341, Jan. 1944, K. T. Wright and E. F. Rebman.

"Farmers' Elevators of Ohio," Agr. Exp. Sta., Wooster, Ohio, Bul. 650, June 1944, B. A. Wallace and J. I. Falconer.

"Peanut Production Possibilities in South Carolina," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Bul. 351, June 1944, J. C. Downing, G. H. Aull, K. V. Goodman and M. J. Peterson.

"Farm Size in Relation to Land Use, Yields, Volume, and Value of Production, and Total Nutrients, Overton County, Tennessee," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., R. R. Ser. Mon. 173, July 28, 1944, H. J. Bonser.

"Efficiency as Applied to Cotton Ginning Business," Agr. Exp. Sta., A. & M. College, College Station, Texas, Bul. 654, Aug. 1944, W. E. Paulson.

"Production, Demand and Price Trends for

Dairy Products in the United States and Washington, Previous to 1944," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Bul. 442, March 1944, H. A. Bendixen and E. F. Dummeier.

"Washington Apple Production Costs During the 1943-44 Season," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Bul. 446, July 1944, M. T. Buchanan.

"Suggestions to Prospective Farmers," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Pop. Bul. 178, Sept. 1944.

"West Virginia Agricultural Statistics 1943," W. Va. Dept. of Agr., Charleston, W. Va., Bul. N. S. 37, March 1944, H. M. Brewer and P. P. Wallrabenstein.

"Handbook on Major Regional Farm Supply Purchasing Cooperatives 1942 and 1943," Farm Cr. Adm., U. S. D. A., Washington, D. C., Misc. Report 73, July 1944, J. G. Knapp.

Potash for Legume Pastures in Florida

(*From page* 25)

annually may be a more economical fertilizer.

The information presented shows that the soils of Florida have little or no reserve potash. Since there is no reserve potash in these soils to replenish the available supply when it is removed by plant uptake or by leaching, potash fertilizer must be applied rather frequently for satisfactory clover growth. Mr. Warner reported in the 1943 Annual Report that growth and ground coverage of White Dutch clover were satisfactory only on areas receiving 400-600 lbs. of 18 per cent superphosphate and 200 lbs. of 50 per cent muriate of potash annually. The general recommendation for the light sandy soils of peninsular Florida is 400-600 lbs. of an 0-10-10 or an 0-14-10 per acre annually. However, it is very likely that further research will indicate that clovers can be maintained on sandy soils with less phosphorus. An 0-8-24 or a similar grade applied at the rate of 250 lbs. per acre annually may prove to be a more economical fertilizer for clovers.

Defective Strawberry Fruit Corrected by Borax

(*From page* 22)

at first because it was not possible to reproduce the disease until artificial lighting was supplied, extending the period of illumination from 5 o'clock in the morning to 9 o'clock at night. Plants grown under this increased photoperiod became yellow and an application of borax equivalent to 30 lbs. an acre was then necessary to promote normal growth. Alfalfa grown under identical conditions, but without added light, was normal in size and color without the addition of borax.

According to this evidence it would seem that the boron requirement of alfalfa plants varies with the length of day. For such other plants as may show this same response, a shortening of the photoperiod is the physiological equivalent of an increase in the supply of boron. The fact that some varieties of strawberries produce embryonic fruit buds in the fall[1] then supplies a possible explanation for the apparent recovery from boron-deficiency symptoms and the subsequent development of fruit from the damaged bud.

In a limited way, it has been possible to demonstrate the prevention of fasciation in strawberry fruit of the Fairfax variety by the addition of borax in plats where fasciation had already been prevalent. At one location, the application of borax at a rate of 10 lbs. per acre gave perfect shaped fruit on one plat

[1] Response of strawberry varieties and species to duration of the daylight period. George M. Darrow and George F. Waldo, U.S.D.A. Tech. Bul. 453 (31 pp) 1934.

while an adjacent plat without borax produced about 80 per cent fasciated berries. On other plats, no attempt was made to compare the results with and without borax, but following the addition of 5 lbs. of borax to the acre, the fasciation which had previously been severe has been eliminated and completely controlled for three consecutive years.

Borax in solution at a concentration of 2 lbs. in 50 gallons of water may safely be sprayed onto strawberry plants; it may be sprinkled in the granular form on dry plants at 5 lbs. per acre, or it may be added in fertilizer at the same rate.

Fasciation of cotton stems due to boron deficiency.

Attempts to use borax at rates exceeding 10 lbs. per acre have resulted in severe leaf burn and the loss of many plants. The 10-lb. rate has only been tested and found safe on one soil having a pH of 6.7. Very satisfactory results both in plant growth and in yield and quality of berries have been obtained at pH 6.0 with applications of 5 lbs. of borax per acre. No symptoms of boron deficiency other than the distortion of the fruit have been noted in this work with strawberries.

The implication that the bud injury, which results in the formation of fasciated fruit, may occur in the fall suggested the advisability of supplying borax before the differentiation of fruit buds occurs. Accordingly, recommendations that the treatment be applied early in September have been made. Whether or not this precaution is necessary, the results obtained have been satisfactory and the practice should be continued until it may be proved by further experimentation that it is unnecessary.

Varieties of strawberries vary in their tendency to fasciation and also in the length of day at which fruit buds are formed. While the possibility that these two factors are associated is of limited practical significance, it is not improbable that buds which are produced in the relatively longer days of the early fall may be the more susceptible to this deformity.

Air Transport for Certain Crops

(*From page* 12)

heads arrived in greener color than the lettuce which came by rail and that the color persisted better throughout the heads. The first shipment was slightly wilted when shipped and slightly wilted on arrival but the other shipments arrived in cool and crisp condition. There were no apparent ill effects from the air trip and there was some decided advantage in appearance.

This lettuce was offered at 5 cents a head higher than the price at which

other lettuce was selling on the same market, as this represented about the difference in the cost of transport. Self-service stores were used in a locality that has customers of slightly better incomes than average. Other carefully planned details of the sales and comparisons will not be outlined here. Suffice it to say that the airborne lettuce sold as well at the higher price as did the surface-borne lettuce at 5 cents per head less.

Just what the effects on costs and prices would be of a great volume of agricultural transport by air, possibly cheaper rates, fluctuations in consumers' incomes, and the sundry other considerations that spring to mind have not yet been measured. But the Secretary of Agriculture, after watching these experiments, says that the telescoping of time and space presents to us a challenge, as well as an opportunity, and that he is convinced air transport gives a very real prospect of developing new and improved methods of moving certain farm perishables which will benefit both producers and consumers.

Fish for Health, Recreation, and Politics

(*From page* 26)

a furniture salesman were fishing from one boat; a probate judge, a school principal, and a druggist from another; a banker's son and a farmer's daughter from another. During the course of one afternoon I overheard them talking about everything they could think of including crops, livestock, health, banking, salesmanship, politics, war, and love. Following the fishing trip it was very evident that all those making the trip were much more intimate and friendly.

At another pond I found a Sunday school class fishing, at another the board of directors of a county farm organization, at another members of a civic club, and at still another the entire "courthouse gang." Leaders of these groups were using fishing and picnicking as methods of promoting better fellowship and good will.

In a smoked-filled conference room in Montgomery, Congressman Frank Boykin, Mobile, told the Alabama Wildlife Association how he uses his fish pond and hunting preserve in making good will and promoting legislation. When he wants certain individuals or groups to become interested in legislation he is promoting, he carries them fishing or hunting. After they have spent several hours or days together on the pond or preserve they are much better friends and understand each other much better. "I have found that it helps a lot," he concluded.

In Chambers County, Probate Judge J. C. Grady has found a well-stocked, fertilized, and maintained fish pond to be a big political asset. He maintains it for the enjoyment and pleasure of his friends, both rural and urban, in and out of the county.

Dr. Glen Davis, dentist of Montgomery, has constructed 14 fish ponds on his 1,000-acre farm. He finds that they make good will for his business. The sale of fishing permits gives him fair returns on his investment.

Bob Dixon, Lowndes County, has 15 fish ponds scattered throughout his pastures so that his cattle will not have to walk their flesh off going for water. "We always have plenty of fresh fish from our ponds," he says.

Both Dr. Davis and Mr. Dixon are finding that fishing is much better when they rotate the fishing from pond to pond. Following tips from fish experts of the Alabama Polytechnic Institute they have observed that fishing is excellent for a few days after a pond is first opened but the fish soon become wise and are hard to catch. By closing the pond for a few days, the

fish become brave and are easy to catch for a few more days. In this way there usually is good fishing in one or more ponds at all times.

Senator Bruce Henderson and his brother of Millers Ferry, Alabama, have found that a fertilized and well-managed 50-acre pond on their plantation helps keep their tenants content and happy. It also makes for good will with their neighbors and friends. Cost of maintaining the pond is paid by charging a small sum for each pound of fish caught.

In Fayette County, Alabama, a war-bond auction was held at the 4-acre fish and mill pond on George Cotton's farm. Fish were auctioned for over $5,000 to the highest purchaser of war bonds. The amount sold was more than twice the quota for the local beat where the auction was held.

Again and again I was told that thousands of families who have been accustomed to fresh meat only at hog-killing time in the fall, and occasionally at other seasons of the year when they killed a surplus chicken, are now enjoying fresh fish meat several times each month. This, say dietitians, is helping improve the health of many families.

Several families are producing and catching enough fish from their ponds to sell. One hotelkeeper serves fish he grows in a pond on his farm, while a merchant keeps home-produced game fish in his refrigerator for his customers.

Hundreds are producing their own fish bait plus some for sale. They grow crickets by feeding them laying mash, fishing worms by keeping them in clay soil and giving them frying fat and corn meal, and goldfish by properly stocking, fertilizing, and maintaining small ponds.

The fish picture has undergone revolutionary changes in Alabama during the past decade. Twelve years ago Alabama's attorney-general ruled that fish were not livestock and that money appropriated for livestock research could not be spent for fish research. Two years ago the Alabama legislature took the opposite view, passed a law making fish a farm product, and provided money for hiring a fish expert to assist in producing and marketing fish.

Latest developments are that farmers of the State have asked, through their farm bureau, that the State laws and regulations be amended to permit the netting and trapping of coarse fish, that licenses not be required for pole and doodle fishing, and that authorities base their wildlife conservation programs upon "the splendid research findings of the Alabama Experiment Station."

Crop Fertilization or Rotation Fertilization

(*From page* 18)

The practical application of these data is simple. If the farmer wishes feed units, but cares little whether they are in the form of concentrates or roughage, it makes little difference how the fertilizer is distributed between the particular crops within the rotation. In fact, it would be more economical to apply all of the fertilizer to any one crop, and not be put to the trouble of fertilizing each separate crop. On the other hand, if it is maximum production of a particular crop that is desired, an entirely different recommendation should be made. In this case, the largest proportion of fertilizer should be applied to the crop where maximum yields are wanted.

Although on the surface this may appear to be a new concept in field crop fertilization recommendations, it is merely evidence supporting present agronomic recommendations, that is, apply the heaviest amounts of fertilizer to crops of highest value in the farming

system. Naturally, sufficient price differential in favor of any one crop would justify the heaviest application to that crop.

These data suggest a very feasible means of increasing production of the badly needed war emergency crops without upsetting the cropping pattern. Emphasis should be placed more on heavy fertilization of the vital war crops and less on expansion of acreage. This system would bring about increased production without greatly increasing labor requirements.

Plowing under a clover crop like this Maine potato farmer is doing is good crop insurance. Liberal fertilization to increase maximum growth of clover in any well-planned rotation is an investment which will pay dividends in higher yields and profits.

Can We Keep Cotton in N. C. Agriculture?

(*From page* 14)

Proper Fertilization of Cotton Is Important

It is unnecessary to call the attention of anyone interested in cotton to the naked cotton stalks from which all of the leaves had shed early in this season. Cotton lint is cellulose which is manufactured by the leaves of the plant. The leaves take carbon dioxide from the air and combine it with water to form a group of carbohydrates such as cellulose of which cotton lint is composed.

It is frequently said that the leaf shedding is desirable as it makes the cotton easier to pick. However, results show that when the leaves shed before the bolls are 30 to 35 days old, the cotton fiber is short, thin, and weak. In extreme cases the bolls are knotty and fail to open. If the cotton were sold on any other basis than by the pound, the cotton might not be worth picking. North Carolina Experiment Station Bulletin No. 308 deals with the effect of potash on the control of "Rust." The symptoms of this deficiency are described as a complete killing of the tissues around the margins of the leaves which later turn brown, dry out, and shed. The growth of the boll is stopped and the small bolls produce a poor

quality of fiber. "A study of these results show that the extra potash treatments produce a better grade, a longer staple, and a stronger fiber than the check."

It may be thought that leaf shedding is desirable for cotton to be picked by a mechanical picker. However, preliminary observations indicate that the resulting knotty, poorly opened bolls are a more objectionable feature for the cotton picker than any extra leaves left on the plant where the bolls open normally. This same thing is usually true with hand-picked cotton.

The shedding of the cotton leaves, resulting in reduced yield and reduced quality, can be attributed to the system of fertilization in many instances. Consider a cotton-peanut rotation producing a bale of cotton, 1,000 lbs. of cotton seed, a ton of peanuts, and a ton of peanut hay. Where the cotton is fertilized with 500 lbs. of a 4-8-4, and top-dressed with 100 lbs. of soda and the peanuts fertilized with 400 lbs. of a 4% potash lime, crops removed around 100 lbs. more nitrogen and 43 lbs. more potash than were applied in the fertilizer. A legume (peanuts) in the rotation takes some nitrogen from the air. The soil itself must supply the potash. This rotation will deplete the soil reserve equivalent to 1,008 lbs. of a 4% potash fertilizer.

Peanuts were used here as an example, but the same thing can be shown on most small grains, lespedeza for hay rotations, or any rotation removing legumes for hay.

An example of quantity production is shown by 21 farmers competing in the 5-acre cotton contest in Scotland County, N. C., in 1944. They averaged 968.2 lbs. of lint per acre—a little over two 500-pound bales with bagging and ties—the highest being 1,210 lbs. of lint and the lowest 625 lbs. of lint.

It was shown that cotton leaves a residue of potash in the soil, but when grown in rotation with legumes harvested for hay, with the legumes receiving little or no potash, there has been a gradual depletion of the potash reserves in the soil which is decreasing the yield and quality of cotton produced.

COTTON QUALITY IS IMPORTANT IF WE ARE TO COMPETE WITH SYNTHETIC FIBERS

During the 1935-39 period, 9.31 bales of cotton were delivered to the consuming establishment for each one bale of rayon. This ratio was 8.63 to 1 in April 1942. Rayon continues its rapid rise and in July 1944, the ratio was 5.76 to 1. These facts are published by the Bureau of Agricultural Economics, August 1944. At least part of this substitution of rayon for cotton can be attributed to our system of "hog ground" buying and keeping the farmer in ignorance of the value of his bale of cotton.

The fact that the farmer spent extra money to buy good seed that produces uniform cotton, perhaps increased his expenses by picking on time, dried out damp cotton before ginning, etc., does not show up in the gin yard. He has a "pig in a poke," and in recognition of this fact good traders who know the value of cotton, buy his cotton at the same price as his neighbor's. The neighbor may have planted run-down seed, fertilized it unwisely, picked and ginned it wet, and in every way did all that he could to produce poor quality cotton. What motive, therefore, has the farmer to produce the kind of cotton that would demand more money for the buyer but not for him?

The Smith-Doxey Classing has been set up as a service by some gins so that within a few days the farmer will receive a card showing the grade, staple, and Government loan value in cents per pound. As soon as the bale of cotton, representing six months' work, comes out of the gin box, many farmers get the hives and can't wait to sell until they find out how much the cotton is worth. Expansion of the Smith-Doxey Classing and education of the farmer to sell his cotton at its highest market value will lead to the production of higher quality cotton. Through the production of higher quality cotton,

which will demand the higher price, the farmer will receive more money for his labor.

New Standards for Cotton Grading

Two varieties of cotton grown at Statesville, N. C., in 1943, both graded strict middling $^{31}/_{32}$ inch. The Government test, reported in June 1944, showed one to have a tensile strength of 77,000 lbs. per square inch and the other 83,000 lbs. per square inch, an increase in strength of 7.7% due to the variety. Cotton breeders know this hidden fact and are breeding for better spinning quality. Will the farmers accept these varieties, even when yield tests show they will produce as much cotton per acre? Hoke County received the trophy last year from the Atlantic Cotton Council for the greatest improvement in their cotton of any county in North Carolina. Hoke County stepped out again this year by labeling their bales of cotton as to variety and purity of seed. Let's not forget also that Hoke County ginners guaranteed their services last year. Thereby, the farmer was assured that if he did his part, the ginner would not destroy the value of quality cotton. This shows how a group of business men can apply business principles to the production of cotton. This appears to be sound business. Why are not more countries following their lead?

High Protein Seed Are Essential to a Livestock Program

Cottonseed meal and oil are by-products of cotton production. Incidentally, many farms can produce more meal and oil, as a by-product, from cotton than they can from soybeans as a cash crop. Using the 1941-42-43 State averages, North Carolina produced about 11.7 bushels of soybeans per acre and 391 pounds of cotton lint. This is around 782 pounds of seed per acre. Assuming 12% oil in soybeans and 15½% in cotton seed, we produced 84.2 pounds of oil per acre with soybeans and 121.2 with cotton seed.

Cottonseed meal plays an important part in livestock feed, and to a certain extent in fertilizers.

Keeping Cotton in North Carolina May be a Hard Fight

Better adapted machinery, higher analysis fertilizers, realizing that cotton fertilizers leave a residue for the next crop, better fertilization, growing better quality of cotton for premium price, giving the farmer the value of his cotton when properly produced, and recognizing the value of locally produced cottonseed meal, all add up to things that can be done to keep cotton in North Carolina. Will they be done and who will do them?

Plow-Sole Fertilizing on the Average Farm

(*From page* 10)

stubble field where clover or alfalfa failed to catch, or maybe a quack-grass or weed patch. It is on these back forty 5- and 10-acre fields where 600 to 800 lbs. of 8-8-8 fertilizer per acre on the plow-sole would have added a good 20 to 25 bushels to the yield or would have made an extra three or four tons of silage per acre. The residual effect of this fertilizer would have greatly helped seedings of clover and alfalfa on these fields the following year.

And so when some critics say, "All right, your plow-sole, heavy rate, high-nitrogen fertilizer idea may have some place on those special crop farms where the operator is growing high value per acre crops, but there is no place for it on the average dairy livestock farm," I'd like to invite them to go over a few of these average-sized farms with me and see the actual conditions that prevail.

It may be interesting at this point to

tell about one of the demonstrations carried out this past year where we held a field day meeting at the time of harvest and invited farmers in to see for themselves. The meeting was held on the Elmer Wiegel farm (Table I). This farm is located in southwestern Wisconsin, Lafayette County, and the soil is a dark colored silt loam. County Agent Gordon Ruehl invited farmers in the neighborhood to come over and see the plots and learn something about this new plow-sole method of fertilizing corn. When we arrived on the scene that afternoon, we found a sizable group of farmers assembled, and there was a big two-row corn picker and three wagons ready to start out. (Mr. Wiegel had pre-arranged this in order to really show the farmer who came the actual differences in yield.)

The picker moved into the test plot field and made a round (4 rows) on each of the plots. There was nearly a wagon box (with double side-boards) full of big ears from the four rows of the plot which had received the plow-sole 8-8-8 (plus 2-12-6 in the hill). By comparison this amounted to a good 25 to 30% more corn than was harvested from the unfertilized four rows. The unfertilized corn was not as well matured and there were more nubbins. When the plots had all been harvested, there were three wagons side by side, and the actual corn from four rows was in each wagon. No doubt was left in the minds of farmers who were present. The plow-sole acre stood out in sharp contrast with the rest of the field. It was taller with larger ears. Here was an acre of corn making better than 100 bushels, and the 35 farmers who came and saw the results were convinced.

When some of the farmers raised the question as to the economy of using $12 to $15 worth of fertilizer per acre, the evidence in the wagons proved that in this case it certainly was profitable. Twenty-five bushels more corn per acre would pay for the fertilizer and leave a profit of $10. At the same time there would be a substantial residual carry-over benefit on this fertilized acre which would undoubtedly show up in the crops of grain and clover in 1945 and 1946.

The importance of a general soil-building program including liming every acre of acid soil on their farms and the use of fertilizer regularly in the rotation was pointed out to these farmers. The importance of careful handling of manure produced on the farm and hill application of fertilizer for corn were stressed. But here these farmers were looking at a field of corn that was averaging better than 75 bushels per acre and yet, by applying 700 pounds of 8-8-8 fertilizer, the yield was increased by an extra 25 bushels.

I am convinced that there is a place for plow-sole fertilizer on the average farm and most certainly on those back forty patches of 5 to 10 acres where manure has not been applied and where it is planned to grow corn. In fact, I am sure that even on some of the major fields on farms where the fertility level is below par and where little or no manure is available, farmers may find this plow-sole method of fertilization with high-nitrogen mixtures highly profitable.

As to the actual ratios of N-P-K in the mixtures we know that soil conditions vary. The ratio of N-P-K must be adjusted to meet the soil and crop requirements. For corn on those rather low fertility upland fields, I think the 8-8-8 mixture fits pretty well. But on the darker colored or bottom land soil types, relatively more potash and less nitrogen should be used and here perhaps such mixtures as the 6-6-18, 5-10-10, or even 0-9-27 may be best suited.

When it comes to such special crops as potatoes, tomatoes, sugar beets, cabbage, carrots, and other crops which have high potash requirements, mixtures carrying relatively more potash should be used. A mixture which is being offered for sale for the first time in Wisconsin in 1945, namely a 6-6-18, may become a popular grade for supplementary application by the plow-sole method for these special crops men-

TABLE 2—RESULTS OF PLOW-SOLE FERTILIZER ON GRAIN AND HAY

Name and address of co-operator and soil type	Treatment and how applied	Yield of grain 1943	Yield of hay 1944	Value of increase grain & hay	Cost of fertilizer	Profit over cost of fertilizer
Edwin Klahn, DeForest Carrington Silt Loam	450# 0–20–0 on plow-sole	55.7 bu.	(alfalfa) 4275#	$14.54	$ 6.15	$ 8.39
	450# 0–20–20 on plow-sole	81.8 bu.	(alfalfa) 4750#	39.00	11.37	27.63
	No fertilizer	49.8 bu.	(alfalfa) 2925#			
Clifford Hopkins, Morrisonville Carrington Silt Loam	450# 0–20–10 on plow-sole plus 100# 0–20–10 drilled with seed	54.8 bu.	(clover) 7875#	45.97	11.22	34.75
	100# 0–20–10 drilled with seed	45.2 bu.	(clover) 5512#	17.92	2.04	15.88
	No fertilizer	31.0 bu.	(clover) 5062#			

tioned. In the sugar beet demonstration carried out on the Wenzel Wenig farm, (Table 1), there was a profitable increase from the application of 8-8-8 fertilizer on the plow-sole. Use of a mixture such as 6-6-18 undoubtedly would have resulted in a larger increase in the final yields.

Another place on the average farm where this plow-sole method of fertilizer application may be found advantageous is for seedings of alfalfa or even clover, where the level of fertility is low and where larger than ordinary amounts of fertilizer are to be used. The results of two such demonstrations in which 450 pounds per acre of various fertilizer mixtures on the plow-sole were applied in one case to medium red clover and in the other case to alfalfa are recorded in Table 2.

It was reasonable to expect that rather heavy applications of phosphate or phosphate-potash mixtures placed on the plow-sole at depths of from 5 to 7 inches for alfalfa and even clover might prove superior to the shallow surface placement now commonly practiced. The rather large increases of grain resulting from this plow-sole fertilizer were a surprise. The yield of oats on the Klahn farm was increased some 40 bushels per acre, and on the Hopkins farm the yield of barley was increased from 31 to 54 bushels where both plow-sole and drilled fertilizer were used. The increase in hay on the Klahn farm was a ton of alfalfa, and on the Hopkins farm nearly a ton and a half of clover. I am certain that the Klahn alfalfa yields in 1945 will show some further response to the fertilizer applied on the plow-sole in the fall of 1942.

It is my belief that where the rates of fertilizer application are larger than the usual 200 or 300 pounds and where fields are seeded to alfalfa or even clover, this plow-sole method of application may be advantageous. The question of whether or not it might be better to mix these larger amounts of fertilizer with the entire plow layer prior to seeding is one which will have to be answered by actual field experiments. The advantages of this placement in bands on the plow-sole are apparent since phosphate fixation is reduced to a minimum and the availability of all plant-food nutrients is enhanced by reason of improved moisture relationships.

Referring again to Table 1 where the plow-sole results on corn, hemp, and sugar beets are recorded, it should again be pointed out that most of the demonstrations were carried out on fields of just average fertility on average sized farms. Exception to this should be noted, however, for plots set up on the James farm at Fort Atkinson. Here the field selected was found to be in a very high state of fertility. In fact, Roy

Marshall (farm manager) told us after we had actually applied the fertilizer that this was one of the highest fertility fields on the farm. The reason County Agent George Wright and Mr. Marshall had selected this field was that it was closest to the buildings and located on the main highway. The soil, a rather dark colored sandy loam underlaid with sand and gravel and of glacial outwash origin, was not only in a high state of fertility but the corn crop suffered from a prolonged period of drought during August. Consequently, we really did not expect to see any marked response here.

It may be interesting to note that in the case of the James farm plots, in fact in the case of two of the other demonstrations recorded in Table 1, we compared fall versus spring application of 8-8-8 fertilizer. From the James farm plots there was a somewhat higher yield where the fertilizer was applied in the fall. Also in the case of the Eric and Ed Aspnes hemp plots, the fall applied 8-8-8 made a better showing. However, on the Clarence Trachte farm the increases were a trifle larger where the plow-sole fertilizer was applied in the spring. From these few comparisons I have concluded that on the heavier types of soil plow-sole fertilizer can be applied in the fall without losing any nitrogen by leaching. In fact many farmers will prefer to apply their fertilizer in the fall when time is not such an important factor as it usually is in the spring.

And so it does appear that the plow-sole method of applying fertilizer at rather large rates per acre does have a place on the average farm. True, there are a few of the "get rich quick" type of operators who may be tempted to crop their land continuously year after year, and of course these farmers are going to run into difficulties unless they make provisions for the maintenance of humus and organic matter. But I am not at all worried about the average livestock or dairy farmer who finds it profitable to apply high-nitrogen fertilizers at heavy rates on a few acres of low fertility land each year. These heavy applications will result in larger residual carry-over benefits, and when such fields are seeded down to legumes the year following, better stands and yields of clover and alfalfa will be obtained.

On the A. R. Livingston farm at Beloit, the yield of hemp for 150 lbs. per acre of 3-9-18 drilled with seed was 4,360 lbs. per acre; for 150 lbs. of 3-9-18 drilled with seed plus 700 lbs. of 8-8-8 on plow-sole, 10,616 lbs. per acre.

In the future when I am asked the question "Where do we go from here on this plow-sole method of fertilizer application?" my answer will be "So far as Wisconsin farmers are concerned, we are on our way in the case of corn from our average all-State yield of 43 bushels per acre to a possible 50- or even 60-bushel average yield. And in the wake of better crops of corn receiving liberal applications of complete fertilizers, we are going to harvest better crops of small grain and legumes. It all adds up to lower production costs and greater profits to Wisconsin farmers."

Some Whys & Wherefores For Air-Conditioning Soils

(*From page* 21)

gen penetration into the soil layers, it was shown that the supply of oxygen was insufficient in the root zones of some soils to keep the roots alive when quantities of organic matter and fertilizers were plowed under.

It was observed and reported that correlated with the apparent healthfulness of the roots in different zones of soil was the presence of ferric iron. In soils with non-responsive corn plants, the ferric iron was found by chemical tests to be limited to the upper soil layers. Frequently ferrous iron was present at the plow-sole depth and deeper. It was found that the oxygen deficiency indicated by the absence of ferric iron, or by the presence of ferrous iron only, was unsuitable for corn root respiration and the maintenance of healthy functioning roots. Brown-discolored and dead roots were in these soil layers. The living root cells require oxygen, either in the soil air, in solution, or available in plant nutrients, to carry on their respiratory processes and to absorb and accumulate plant nutrients.

It was pointed out that it was imperative to make the soil tests for ferric and ferrous iron immediately on freshly exposed samples of soil in order to measure qualitatively the status of the oxygen tension at that particular time. Iron compounds in the reduced state are relatively unstable and oxidize rapidly when exposed to the air and sunlight. The surface soil with good aeration should be the check-test sample against which the tests for ferric iron in the deeper layers are compared. In this manner the effective penetration of oxygen into the soil can be noted quickly at any time during the growing season. The condition of the roots should be observed also at each level of soil tested. By this means a more satisfactory diagnosis of plant-deficiency symptoms and lack of response of the plants to applied fertilizers can be made.

Such tests and observations serve only as guides for research students to follow in their investigations. The importance of looking underground and studying the current oxidation-reduction phenomena in soil-plant interrelationships in the field, in addition to laboratory investigations, cannot be over emphasized. At no time can the plants above ground be better than their root systems. Furthermore, soil samples exposed to air or dried are not serviceable for these studies.

Agricultural Significance of Soil Structure

Baver (6), in his most interesting book on soil physics, discusses the agricultural significance of soil structure in part as follows: (pages 188-189)—

"Soil structure is the key to soil fertility! This concept has been recognized by eminent soil scientists for a long time—but this pronouncement—has been heard by farmers, agriculturists, and some scientists only as faint whispers among the arguments for a

chemical solution of profitable crop production.

"Common observations as well as certain experimental results have shown that some soils do not respond to fertilization even though they are not highly productive. Crop yields vary between wide limits depending upon the amount and distribution of rainfall. Chemical analyses show that sufficient fertility elements are present to produce abundant crops. What, then, are the factors that limit the anticipated crop production?

"It is known that plants require nutrients, water, and air for growth. The amount of nutrients in the soil is usually taken as an index of fertility. The air and water relationships are dependent upon structure. If inadequate moisture is present, the plant cannot utilize nutrients; it cannot carry on its normal physiological functions. If excessive water or insufficient air (oxygen) is present, the plant cannot make efficient use of the nutrients in the soil. The growth of plant roots and the germination of seeds require favorable conditions for respiration. If there is a limited supply of oxygen within the soil as a result of poor structural conditions, respiration processes are hindered; germination and growth are retarded. Moreover, a small root system restricts the soil volume in which nutrients are available to the plant. Consequently, a low air capacity may affect plant development in more than one way.

"In addition to the effect of improper air and water relationships on the germination and growth of plants, bacterial activity is also hindered. Nitrification processes cannot proceed normally and the production of nitrates from organic matter is diminished to the point that the plant suffers. Other aerobic biological activities are impeded.

"These facts indicate that abundant nutrients in the soil do not insure good crop production. The investigations of numerous workers emphasize that insufficient attention has been given to providing a favorable environment for the germination of seeds and growth of crops. Little consideration has been paid to the development and fertilization of cropping systems from the standpoint of their effects upon structure and other physical properties of soil. The future promises a rapid growth in the interest and emphasis that will be placed upon the agricultural value of good soil structure."

Future Research

From the above brief discussion of plant nutrition problems, it will be seen that many additional field experiments can be conducted to enhance the usage of adequate quantities of plant nutrients. The relative importance of the factors that control good soil structure and adequate aeration and of the interrelationships of root respiration and salt absorption and accumulation in variously fertilized plants should be determined in all types of soils. The method of applying fertilizers in plow furrows is a forward step in producing crops in the Midwest, and when all of the factors, soil and climatic, are studied in relation to it, it will lead to the increased enrichment of the soil fertility and the economical production of commercial feeds and foodstuffs.

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Silo Scribe

(*From page* 5)

Before reaching this, however, I should not do justice to the changes in contents of the farm press without reference to the fact that federal domination, national rather than state viewpoints, regional associations of producers instead of isolated state units have changed the whole farm scene and reflect themselves in the type of stories published.

With one notable exception, too often neglected! This is the fact that soils and practices differ in the states and there is no excuse for minimizing the vital need for continued selective treatment of peculiar state problems as they arise. To gloss these over, to avoid technical articles, and to write mostly from the economic, cooperative, and legislative viewpoint surely omit giving readers the things they really need.

You must hunt pretty carefully to locate many bulletin reviews or lists of notable experiment station findings in many of our farm papers today. There may be one reason why the technical and scientific lore is not so prominent now. Perhaps it is because the colleges have radio stations, more competent and efficient and knowing press and publicity departments, and avenues into the daily and weekly press which have been newly tapped. With the rise of the daily on the rural route, the college energy directed itself to training and encouraging young writers to seek this field. The treatment had to be a little different, maybe with more tempting bait attached. But as long as the farm press sought to hold reader interest by modern dress and retention of the how-to-do-it department and the farm mail-bag letters, some of the traditions of simpler days remained as a bulwark to shield it. This plus the fearlessness and independence of the editors, who knew their stuff and played no favorites!

When I took hold of one end of a farm paper, we had two unfailing sources of reliance in case of need for copy. One was the avid rural letter-writers, mainly women and 4-H kids, although sometimes crotchety old men, whose spillway was the mail-bag department we issued regularly. We had to edit out a few crudities and cuss words, fix up some spelling, and by all means put in a period soon enough. It was a delight to our subscribers, whom we called the "cash customers."

The other unfailing solace to behind-hand writers for the silo belt was the obliging college professors. Today I know of only one farm paper that uses most of its space for articles prepared by college men, with or without triple-deck, six-point tabular matter. Some of us say they are just old-fashioned editors, or too lazy to trim up the pages with something snappier. At any rate to my knowledge no reader-interest survey page by page has been taken of any farm paper to see how thoroughly the readers are fascinated by the college type of exposition. So for one, I am mum. All I can say is that the professor as a farm paper writer has largely vanished with the woodcut and the sermon.

IF I were to voice an idea on that I would venture the guess that the professor was long on facts and good will but very shy of terminal facilities. You could not safely take one of his pieces and begin to chop and whack at it with the handy shears, or do any pasting here and there, or add any interlined comments. He was also afraid to come out without plenty of precedent elsewhere by others of the same craft. He simply would not tolerate a scoop or a bizarre presentation. The net result had to be academic and scientific and wholly unreadable, except by some other savant.

(I trust you will not confuse anything just said with the contents of the pres-

ent publication, which is not a standard farm paper read mostly by dirt farmers. It is in a class by itself or I would not be writing for it!)

I will admit that college men have also changed along with the farm press. Thanks to the tutelage and the blisters raised by the college editors in criticizing bulletin copy, the batting average of scientific men has risen.

When I said that the collegiate wrote too dully and too long, I hasten to point out something affecting my own personal mannerism. I do this to escape being unfair and pedantic. It is simply this—that the length and treatment common to the present writer's tradition in these columns is *not* suitable to the farm press.

While treading on your toes all this time and doing my dozens regularly herein, some of my energy has been taken up with the duties of a humble Silo Scribe. It has not been feasible or practical for us to use the type of lingo often perpetrated herein within the columns of a farm paper.

This brings up the fact that the farm press is much given to the serious side still. Somewhere in between the length and scope and factual data of the scientist and the happy, easy-to-read, broken-up style of treatment lies the best field for the farm paper editor.

If he breaks away too fast and tries to inject humor and sketchy coloration into his copy, there will be no end of opposition found by the circulation men when they ask for renewals. Their farm papers must be serious, factual, tolerant, not abusive or partisan, and avoid religion, social antipathies, and scandal. I think that one change could be made, and horrors to admit it, but there is room for some comic strips tuned to the soil. Certain reader-interest studies we have made show plainly that farmers relish a little fun, but fence it off—never let it mingle too close to the veterinary or cooperative departments.

Pictorial improvement has been a notable turn for the better in the farm press. It is not alone a matter of owning good staff kodaks, but it belongs also to the press room. The best camera made handled by the slickest shutter man you can hire won't overcome the daubing which fibrous stock and sloppy presswork will produce. Hence progress has been seen in both art appreciation in the editorial room and managerial skill in the mechanical department.

When I think of some of the productions we issued in the far-gone days I can hardly see how we had to wait until depression times to lose subscribers. The average quality of latter-day farm publications from mechanical standpoints is something to brag about, when you take time to see what they looked like twenty years ago.

And you've got to keep up appearances. Even the old Hey Rube comic character has disappeared from the rural scene. Farm folks want the best of everything. They won't tolerate dingy, muddy periodicals. The guy who buys the paper—and I pity him now—has as much to do with the net result in reader interest as the fellow who pushes the copy.

I GUESS my time and your patience have run out. I haven't had a chance to tell you about the big meals I have eaten as guest of honor in some farmhouse receiving my latest attention editorially. I have not touched on sundry reunions of the fraternity or the friendly name-calling we have indulged in. I might dwell again on fairs and county agent demonstrations and rural art shows and corn-husking contests, on prize contests and hog-calling events galore. There has been a mighty pageant of progress and I have taken a heap of pleasure in living a part of it.

The farm press has been a great force for culture and encouragement to agrarian endeavor. But when the boys come marching home and new hands man the helm, the job will be bigger than ever and the rewards more satisfying.

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Fertilize Potatoes for Quality and Profits (Pacific Coast)
Fertilizing Small Fruits (Pacific Coast)
Better Corn (Midwest) and (Northeast)
Fertilize Pastures for Better Livestock (Pacific Coast)
Of Course I'm Interested (Pastures, Canada)
Meet the Family (Canada)

Reprints

T-8 A Balanced Fertilizer for Bright Tobacco
N-9 Problems of Feeding Cigarleaf Tobacco
T-9 Fertilizing Potatoes in New England
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
J-4-40 Potash Helps Cotton Resist Wilt, Rust, and Drought
S-5-40 What Is the Matter with Your Soil?
K-4-41 The Nutrition of Muck Crops
B-1-42 Growing Ladino Clover in the Northeast
E-2-42 Fertilizing for More and Better Vegetables
S-6-42 A Comparison of Boron Deficiency Symptoms and Potato Leafhopper Injury on Alfalfa
DD-10-42 Clover Pastures for the Coastal Plains
FF-11-42 Boron in Agriculture
GG-11-42 Some Experiences in Applying Fertilizers
II-12-42 Wartime Contribution of the American Potash Industry
JJ-12-42 The Place of Boron in Growing Truck
A-1-43 The Salt That Nearly Lost a War
H-2-43 Plant Food for Peach Profits
J-2-43 Maintaining Fertility When Growing Peanuts
M-3-43 Lespedeza Is Not A Poor Land Crop
N-3-43 Boron and Potash for Alfalfa in the Northeast
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THE AMERICAN POTASH INSTITUTE

1155 16TH STREET, N. W. **WASHINGTON 6, D. C.**

"Thank you so much," said a woman to the man who had given her his seat in a street car. "That was very kind of you."

"Not at all, ma'am, not at all," protested the man. "I know some men don't give up their seats to anyone except pretty girls, but looks don't make any difference to me."

"What has yoh named de baby, Mrs. Jefferson?"

"Red Stamp Jackson; Ah put de Jackson in to show his male sex, an' de Red Stamp show how precious he am."

Salty: "Gosh, you have a lovely figure."

Susie: "Oh, let's not go all over that again."

HE PASSED THROUGH

A colored soldier was stopped by a sentry one dark night.

"Let me see your pass paper," said the sentry.

"Ain't got no pass paper," said the other.

"Can't pass through here without no pass paper," declared the sentry.

The first soldier rolled his eyes, reached into his coat pocket, drew forth a razor and opened it.

"Boy," he snarled, "I'se got a mother in heaven, a father in hell, and a gal in Blankville. And, believe me, I'se gwine to see one o' dem tonight."

The calmest husbands make the stormiest wives.

MOTHER KNOWS

A young man and his fiancée had wed and were spending their honeymoon at a large hotel. When bedtime came the bride went to bed and the groom sat by the window and gazed at the moon and stars. The bride called to him and asked: "Why don't you come to bed?"

Replied he: "My mother told me my wedding night would be the most beautiful night of my life, and I'm not going to miss a minute of it."

"How's your new girl?"

"Not very good."

"Boy, you always were lucky."

MIND YOUR MANNERS!

A man who has learned to share taxis in Washington went to Boston on business. He jumped into a cab with another passenger at Boston's South station, having overheard the first fare give a destination close to his. He sat back with a cheery smile and, turning to the other passenger, said pleasantly, "My name's Jennings."

There was a long pause.

"Mine," said the Bostonian coldly, "is not."

A Navy recruit on guard had strict orders to admit no car unless it bore a special tag. He stopped one whose passenger was a high-ranking officer.

The guard heard the brass-hat order his driver to go through, and calmly said:

"I'm sorry, sir, but I'm new at this. Who do I shoot—you or the driver?"

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

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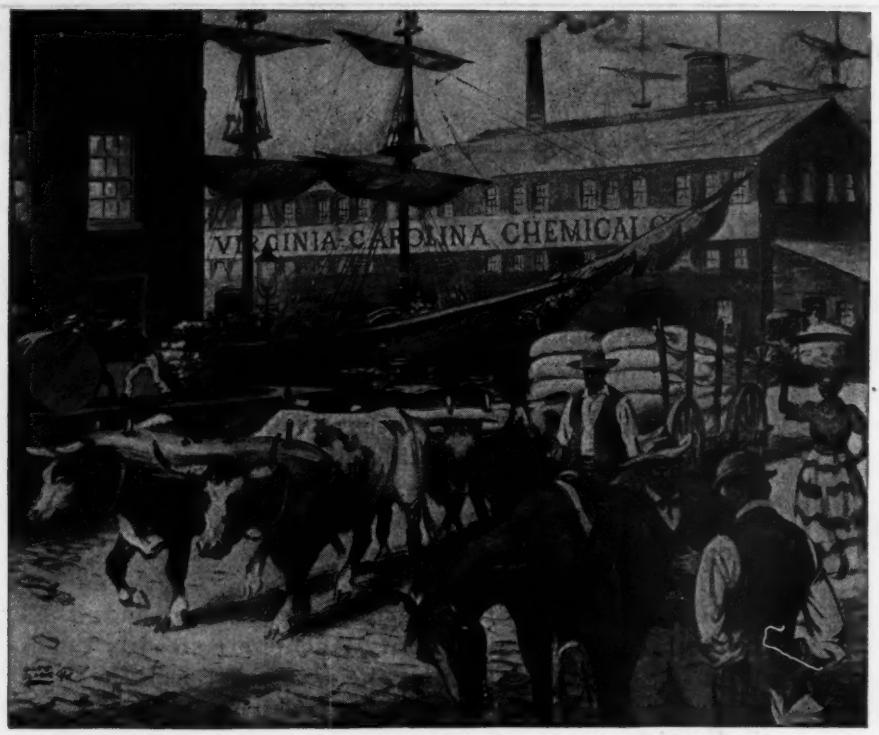

THE BIRTH OF A NEW IDEA

THE FIRST V-C Fertilizers were delivered to the farm in 1895. These fertilizers were the beginning of a new idea in the manufacture and distribution of commercial plant-food. For economy and convenience, V-C factories were to be located near the farms they served and yet each factory was to benefit from the scientific research, experience, skill and facilities of a national organization.

Today, through its network of 34 fertilizer factories, its phosphate rock mines, its 20 sulphuric acid plants, its 26 superphosphate producing units, its chemicals division and its analytical and research laboratories, the V-C organization serves farmers in every state from the Rocky Mountains to the Atlantic and from Canada to the Gulf of Mexico.

Today more V-C customers are using more V-C Fertilizers than ever before in history . . . their total crop production is greater than ever before in history . . . and their cash farm income is higher than ever before in history.

It is fitting and proper that V-C's 50TH ANNIVERSARY should find V-C Fertilizers rendering their greatest service to the American farmer.

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Seeds Protected months in advance with

THE PROVEN SEED PROTECTANT

Spergon is so stable that seeds can be treated months before planting. This fine powder has unusual adhering qualities. Coats seeds evenly, completely.

Safe. Spergon is a true organic chemical—non-poisonous and non-irritating to operator when used as a seed protectant. Also harmless to delicate seeds and plants.

Bigger Stands and Yields. Experimental station tests prove that Spergon-treated seeds produce larger stands and yields than untreated seeds.

Self-Lubricating. On Spergon-treated peas, for example, no graphite is needed to help seeds through the drill.

TYPICAL DOSAGES

Corn . . . 1½ oz. per bu. seed.		Soy beans . 2 oz. per bu. Seed.	
Peas . . . 2 " " " "		Sorghum . . 1½ " " " "	
Beans . . 2 " " " "		Flax . . . . . 2 " " " "	
(Including Limas)		Peanuts . . . 3 " "100 lbs. seed.	

Spergon pays its way many times over

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Save That Soil

A 16mm., sound, color film depicting the early South, the results of the one-crop system, and the reclamation and conservation of Southern soils through the use of legumes and modern methods of soil management.

Running time, 28 min. (on 1200-ft. reel).

Other 16MM. COLOR FILMS AVAILABLE

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Bringing Citrus Quality to Market
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New Soils from Old
Potash Production in America

We shall be pleased to loan any of these films to agricultural colleges and experiment stations, county agricultural agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible) and period of time of loan.

For additional information write:

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